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UTAH FLORA: CHENOPODIACEAE

Stanley L. Welsh¹

ABSTRACT.— The Chenopodiaceae for Utah are revised. Descriptions of the family and of its genera and species are included. Keys to the genera, species, and infraspecific taxa are provided, along with pertinent discussion. Treated are 18 genera, 56 species, and 13 infraspecific taxa. Newly described taxa are *Atriplex canescens* (Pursh) Nutt. var. *gigantea* Welsh & Stutz, *Ceratoides lanata* (Pursh) J. T. Howell var. *ruinina* Welsh, and *Chenopodium capitatum* (L.) Asch. var. *parvicapitatum* Welsh. New nomenclatural combinations are: *Atriplex canescens* (Pursh) Nutt. var. *occidentalis* (Torr. & Frem.) Welsh & Stutz; *Atriplex gardneri* (Moq.) D. Dietr. — var. *bonnevillensis* (C. A. Hanson) Welsh, var. *cuneata* (A. Nels.) Welsh, var. *falcata* (Jones) Welsh, and var. *welshii* (C. A. Hanson) Welsh; *Atriplex patula* L. var. *triangularis* (Willd.) Thorne & Welsh; *Atriplex saccaria* Wats. var. *caput-medusae* (Eastw.) Welsh; *Zuckia brandegei* (Gray) Welsh & Stutz, and *Zuckia brandegei* var. *arizonica* (Standl.) Welsh.

Members of the Chenopodiaceae have long been regarded as taxonomically troublesome. Reasons for the difficulties involve reduction and simplification of floral parts leading to use of features of fruit, bracts, vegetative characters, and, more recently, phytochemistry as diagnostic tools. Problems are compounded due to introduction of many of the species from the Old World. Both taxonomic and nomenclatural difficulties occur within the taxa in the Old World, the plants having proved to be only somewhat less perplexing to Eurasian taxonomists than to American ones. Once introduced into the New World, the problems of adequate taxonomy and nomenclature are made more difficult because of lack of adequate specimens for comparison. Often literature is not available to make valid judgements, or is difficult to use because of language barriers. Only portions of the total variability of Old World taxa are introduced, and our view of morphological

limits of the taxa differs from that held by taxonomists working with them in their home environments. Some indigenous taxa are made problematical by having Old World counterparts, from which they are segregated by diagnostic features that might be negligible. Nomenclatural decisions are based on determinations made initially in Europe, some more than a century ago. Compilation and correlation of all data available often does not lead to clarification of taxonomic limits. Additionally, hybridization is known to occur in many indigenous taxa (e.g., the *gardneri* complex of *Atriplex*).

Plants of the Chenopodiaceae are of vast ecological importance due to their ability to occupy saline or alkaline substrates. Lands with such substrates are abundant in Utah. The saline substrates of valley bottoms, badjadas, alluvial fans, and of many geological strata are sources of plants that are important for use by grazing and browsing animals, es-

¹Life Science Museum and Department of Botany and Range Science, Brigham Young University, Provo, Utah 84602.

pecially in autumn, winter, and early spring. Chenopods are often principal components, and many of them are utilized by sheep, cattle, horses, other domestic livestock, and wildlife. Perennial species of *Atriplex*, usually referred to as saltbush, are especially important browse plants on wildland ranges in Utah. The lambsquarter or pigweed, *Chenopodium album*, is a serious weed of gardens but is not confined to them. Russian thistle and halogeton are weedy species that occupy disturbed sites similar to those supporting the cheatgrass, *Bromus tectorum* L. Both are used for food, supplementally, on winter grazing areas by sheep and by cattle. However, halogeton contains high concentrations of oxalates, which, when eaten in quantity, result in calcium shock and subsequent death. Serious losses of sheep have occurred since introduction of this attractive annual in the 1930s in Nevada. Greasewood is also a potential oxalate poisoner, but is eaten, especially by cattle, in some years without apparent harm. Annual species of *Chenopodium* and *Atriplex* can become poisonous through accumulation of nitrates in heavily fertilized cultivated lands.

In Utah the family consists of 18 genera (6 entirely introduced, and 3 with both New and Old World representatives), 56 species,

and 13 varieties. Eighteen (or 26 percent) of the taxa (all of them species) are introduced. This is a high proportion of introductions, much higher than for most families of comparable or larger size. Because of the abundance of saline habitats in Utah, many more introductions from elsewhere in the world should be expected.

Many of the species change colors in autumn, taking on themselves hues of red, red-orange, or purple, resulting in a subtle display of great beauty. The drab appearance of the growing season gives way to a pleasing glow, especially when viewed in early morning or evening light.

CHENOPODIACEAE

Goosefoot Family

Herbs, subshrubs, or shrubs, often succulent or scurfy; leaves simple, alternate or opposite, estipulate; flowers inconspicuous, monoecious, dioecious, polygamous, or perfect; calyx persistent, 1- to 5-lobed, enclosing the fruit, or lacking in some pistillate flowers; corolla none; stamens opposite the calyx lobes and as many or fewer; pistil with 1-3 stigmas, 1-loculed and 1-ovuled; fruit a utricle.

- 1. Leaves scalelike; stems fleshy; plants of saline pans and other salty sites 2
- Leaves well developed, not scalelike; stems not fleshy; plants of various habitats 3
- 2(1). Leaves alternate; plants woody at the base, mainly 3-8 dm tall *Allenrolfea*
- Leaves opposite; plants herbaceous, mainly 0.5-3 dm tall *Salicornia*
- 3(1). Leaves opposite, united at the base; sepals strongly imbricate, scarcely united, chartaceous; plants rare in western Utah *Nitrophila*
- Leaves alternate or rarely some opposite; sepals slightly if at all imbricate, herbaceous 4
- 4(2). Leaves or bracts of inflorescence tipped with a spine or a spinelike bristle 5
- Leaves and floral bracts not bristle or spine tipped 6
- 5(4). Leaves linear to subulate; bracts of inflorescence ovate-lanceolate, spine tipped; fruiting sepals winged on the back; flowers not embedded in hair *Salsola*
- Leaves sausagelike, abruptly spine tipped; bracts of inflorescence not different from the leaves; sepals ending in wings; flowers embedded in hair *Halogeton*
- 6(4). Leaves sub- or semicylindric to linear, usually fleshy 7
- Leaves with flattened blades, not especially fleshy 9

- 7(6). Shrubs, armed with thorny branchlets; staminate flowers in spikes, the pistillate flowers solitary and axillary *Sarcobatus*
 — Shrubs or herbs, not armed; flowers perfect or both perfect and pistillate 8
- 8(7). Herbage villous-tomentose; plants low subshrubs *Kochia*
 — Herbage glabrous and glaucous, or puberulent; plants annual or perennial, or if subshrubs then tall *Suaeda*
- 9(6). Plants densely white-hairy with at least some dendritic hairs, these becoming golden brown in age; shrubs of broad distribution *Ceratoides*
 — Plants variously hairy or glabrous, but not as above; shrubs or herbs of various distribution 10
- 10(9). Flowers imperfect, the pistillate enclosed in 2 accrescent or connate bracts 11
 — Flowers perfect or some also pistillate, all with sepals and not enclosed by paired bracts 14
- 11(10). Stigmas 4 or 5; plants green, cultivated potherbs *Spinacia*
 — Stigmas 2; plants green, grayish, or yellow-green, not or seldom cultivated 12
- 12(11). Bracts dorsally compressed, variously tuberculate, smooth, or winged; pubescence of inflated hairs or none; plants shrubs or perennial or annual herbs; axillary rounded buds lacking *Atriplex*
 — Bracts laterally compressed or 6- to 8-ribbed, lacking appendages; pubescence of simple or branched hairs; plants shrubby; axillary rounded buds present 13
- 13(12). Shrubs with divaricate often thorny branches; bracts with margins thickened, spongy within; pubescence of branched hairs *Grayia*
 — Shrubs with erect nonthorny branches; bracts with margins not spongy thickened, either obcompressed or dorsiventrally compressed and 6-ribbed; pubescence of scurfy or moniliform hairs *Zuckia*
- 14(10). Plants more or less tomentulous; calyx transversely winged in fruit *Cycloloma*
 — Plants glabrous, scurfy, pilose, or otherwise pubescent, but not or seldom as above; calyx not transversely winged in fruit, except in *Kochia* (q.v.), and then not tomentulous 15
- 15(14). Perianth developing conspicuous horizontal, scarious wings or armed with curved or uncinat spines 16
 — Perianth lobes rounded or keeled on the back, lacking wings or spines 17
- 16(15). Perianth developing conspicuous, horizontal, scarious wings *Kochia*
 — Perianth with lobes each armed with a curved or uncinat spine *Bassia*
- 17(15). Calyx becoming woody in age; ovary partly inferior; plants cultivated, rarely escaping *Beta*
 — Calyx not woody; ovary superior; plants not or seldom cultivated 18
- 18(17). Calyx lobes 5, largely concealing to exposing the fruit; stamens usually 5; herbage glabrous or scurfy *Chenopodium*
 — Calyx lobes 1-3, the fruit largely exposed; stamens 1-3; plants not scurfy 19
- 19(18). Leaves hastately lobed or if entire 4-12 mm long, the blades mainly 2-8 mm broad or more; calyx 1-lobed; stamens 1; plants widespread, of many habitats *Monolepis*
 — Leaves linear, 0.8-6 cm long, entire, 1-2 mm wide; calyx 1- to 3-lobed; stamens 1-3; plants of sandy, low-elevation sites *Corispermum*

ALLENROLFEA Kuntze

ATRIPLEX L.

Succulent, glabrous subshrubs or shrubs; branches alternate, jointed; leaves reduced to fleshy scales, alternate; flowers perfect, sessile, borne spirally in 3s or 5s in axils of petalate bracts, arranged in cylindrical erect spikes; sepals reduced, 4- to 5-lobed; stamens 1 or 2, exerted; stigmas 2 or 3; utricle ovoid, flattened, the pericarp free, membranous.

Allenrolfea occidentalis (Wats.) Kuntze Iodine Bush. [*Halostachys occidentalis* Wats., type from Raft River Valley]. Plants mainly 3-8(12) dm tall, woody at least below, glabrous and more or less glaucous; stems constricted at the nodes, fleshy; leaves very short, obtusely triangular; spikes 6-30 mm long; calyx enclosing the fruit; seeds brown. Saline and alkaline pans, springs, and seeps, and in other saline sites, often with saltgrass, samphire, seepweed, and other halophytes, at 1380 to 1620 m in Beaver, Box Elder, Emery, Grand, Iron, Juab, Millard, Salt Lake, Tooele, Utah, and Wayne counties; Oregon and Idaho, south to California, Arizona, Texas, and Mexico; 25 (iv). The plants accommodate high soil salinity by including salt within the protoplast, giving the plant a salty flavor. Because of its salty flavor the plants are often referred to as "pickleweed."

Monoecious or dioecious herbs or shrubs, often with scurfy (mealy) collapsed hairs; leaves alternate or opposite; flowers small, inconspicuous, borne in axillary clusters, glomerules, or in spicate panicles; staminate flowers with 3- to 5-parted calyx, bractless, with 3-5 stamens; pistillate flowers without a perianth and the pistil naked or rarely with a perianth, commonly enclosed within a pair of foliaceous bracts, enlarged in fruit, variously thickened and appendaged; styles 2; utricle with the pericarp free; seeds flattened, mainly erect. The genus is complex both taxonomically and nomenclaturally. It consists of native and introduced herbs and shrubs. Indigenous shrubby species form hybrids with all or most of their constituent taxa, wherever they come in contact. The resulting plasticity allows these remarkable plants to occupy numerous habitats, but poses problems that preclude a "neat" taxonomic treatment. The following keys are tentative at best.

HANSON, C. A. 1962. Perennial *Atriplex* of Utah and the northern deserts. Unpublished thesis. Brigham Young Univ. 133 pp.
 THORNE, K. H. 1977. A revision of the herbaceous members of the genus *Atriplex* (Chenopodiaceae) for the state of Utah. Unpublished thesis. Brigham Young Univ. 78 pp.

- 1. Plants herbaceous annuals Key I.
- Plants woody, at least below, perennial Key II.

KEY I.

Plants herbaceous annuals.

- 1. Seeds of 2 types, black and brown; plants mainly introduced 2
- Seeds all alike, either black or brown; plants indigenous 5
- 2(1). Fruiting bracts orbicular or nearly so, the dorsal surfaces smooth, entire 3
- Fruiting bracts triangular to ovate or rhombic, the dorsal surfaces usually tubercled, denticulate to entire 4
- 3(2). Black seeds horizontal, enclosed in a membranous calyx; brown seeds vertical between very large bracts *A. hortensis*
- Black seeds vertical between small bracts; brown seeds vertical between large bracts *A. heterosperma*
- 4(2). Lowermost leaves ovate, dentate, sessile or short-petiolate *A. rosea*
- Lowermost leaves lanceolate, rhombic, triangular, or hastate, dentate or entire, petiolate *A. patula*

- 5(1). Plants dioecious, widely distributed in eastern Utah, rarely elsewhere *A. powellii*
 — Plants monoecious, of various distribution 6
- 6(5). Fruiting bracts orbicular or nearly so, the margins denticulate to lacerate;
 plants of Washington County *A. elegans*
 — Fruiting bracts various in outline, but, if orbicular, the margins entire and
 seldom if ever in Washington County 7
- 7(6). Lower leaves linear to lanceolate, sessile, not over 2.5 cm long *A. wolfii*
 — Lower leaves rhombic, deltoid, or cordate, usually at least some petiolate 8
- 8(7). Fruiting bracts all stipitate, or some of them sessile to subsessile, when stipitate
 usually prominently tubercled; plants forming low, rounded clumps on saline
 substrates in eastern Utah *A. saccharia*
 — Fruiting bracts all sessile or subsessile, variously tubercled or, if stipitate, as in
A. graciliflora, the surfaces smooth; plants slender or clump forming, variously
 distributed 9
- 9(8). Fruiting bracts truncate and with 3 minute teeth apically; upper leaves sessile .
 *A. truncata*
 — Fruiting bracts not truncate apically; upper leaves petiolate or subsessile 10
- 10(9). Fruiting bracts with margins dentate, foliaceous well below the apex, the
 surfaces sometimes with appendages *A. argentea*
 — Fruiting bracts samaralike, orbicular, with a winged entire margin surrounding
 the seed; surfaces smooth *A. graciliflora*

KEY II.

Plants woody, at least below, perennial.

1. Leaves dentate (at least some); plants of Washington County 2
 — Leaves entire; plants of various distribution 3
- 2(1). Plants monoecious; leaves green, ovate, irregularly and shortly dentate; weedy
 species near St. George *A. semibaccata*
 — Plants dioecious; leaves silvery white, orbicular, definitely and coarsely
 toothed; indigenous *A. hymenelytra*
- 3(1). Leaf blades subhastate; shrubs to 30 dm tall; plants of Washington County 4
 — Leaf blades attenuate to rounded basally; shrubs mainly less than 2 m tall;
 plants of various distribution 5
- 4(3). Branchlets terete *A. lentiformis*
 — Branchlets angled *A. torreyi*
- 5(3). Bracts with 4 lateral wings or 4 rows of teeth; plants unarmed 6
 — Bracts without lateral wings, merely tuberculate or smooth dorsally; plants
 sometimes thorny 8
- 6(5). Leaves more than 8 mm wide; bract tip with or without lateral teeth; canyons
 of the Colorado *A. garrettii*
 — Leaves less than 8 mm wide; bract tip without lateral teeth; distribution
 various 7

- 7(6). Bracts more than 9 mm wide, with tips not exceeding the wings; staminate flowers yellow; shrubs to 2 m tall, widely distributed *A. canescens*
- Bracts less than 9 mm wide, with tips exceeding the wings; staminate flowers mostly brown; plants mainly 5–10 dm tall, of playas in western Utah *A. gardneri*
- 8(5). Plants with thorny branches; bracts foliose, united only basally, the surfaces smooth; staminate flowers yellow; widely distributed *A. confertifolia*
- Plants lacking thorny branches; bracts not foliose, at least one-third united and the surfaces with appendages; staminate flowers yellow or brown 9
- 9(8). Leaves 2–4 mm wide; bracts with appendages on lower one-third; staminate flowers
in spikes; plants prostrate *A. corrugata*
- Leaves often more than 4 mm wide; bracts with appendages various; staminate flowers mainly in panicles; plants not or seldom prostrate 10
- 10(9). Leaves oblong-ovate to orbicular, more than 10 mm wide, the lowermost alternate; staminate glomerules very numerous; plants of San Juan County
..... *A. obovata*
- Leaves linear to oblong, mainly less than 10 mm wide, or, if wider, the lowermost opposite; staminate glomerules merely numerous; plants of Great Basin and northern Colorado River drainage, less commonly in San Juan County
..... *A. gardneri*

Atriplex argentea Nutt. Silver Orach. [*A. rydbergii* Standley, type from south of Moab]. Plants annual, monoecious; stems simple or freely branched; leaves petiolate or the upper ones sessile, the blades 0.5–6 cm long, 0.4–5 cm wide, lance-ovate, lanceolate, deltoid, or cordate, runcinate to subhastate basally, obtuse to acute apically, entire or essentially so, scurfy (glabrous); staminate flowers with 5-parted calyx; fruiting bracts sessile, or subsessile, 4–5 mm long, 4–10 mm wide, the margin foliaceous below the apex, dentate to lacinate, the face smooth, tubercled, or crested; seeds ca 2 mm wide, brown. $2n = 18$. Mat-atriples, shadscale, and greasewood communities at 1125 to 1770 m in Duchesne, Emery, Kane, Rich, San Juan, Salt Lake (?), Sevier, Summit, and Uintah counties; widespread in western U.S. and Mexico; 20 (0).

Atriplex canescens (Pursh) Nutt. Four-wing Saltbush. [*Calligonum canescens* Pursh]. Dioecious or rarely monoecious shrubs, mainly 8–20 dm tall, not especially armed; leaves persistent, alternate, sessile or nearly so, 10–40 mm long, 2–8 mm wide, linear to oblanceolate, oblong, or obovate, entire, retuse to obtuse apically; staminate flowers yellow (rarely brown), in clusters 2–3 mm wide, in panicles; pistillate flowers borne in pan-

icles 5–40 cm long; fruiting bracts 9–25 mm long and as wide, on pedicels 1–8 mm long, with 4 prominent wings extending the bract length, united throughout; surface of wings and body smooth or reticulate; wings dentate to entire; apex toothed; seeds 1.5–2.5 mm wide; $2n = 18, 36$, or higher. Sandy, commonly non saline, sites in Joshua tree, blackbrush, greasewood, salt desert shrub, sagebrush, mountain brush, and pinyon-juniper communities at 670 to 2380 m, known in all Utah counties except Cache, Morgan, Rich, Wasatch, and Weber; Washington to Alberta and South Dakota, south to Mexico and Texas; 199 (xxiv). This species forms hybrids with *A. confertifolia* and *A. gardneri* varieties (see var. *bonnevillensis*). Materials from the type locality of the species in South Dakota is a low subherbaceous plant that differs from our shrubby tall material. In a strict sense the common phase of our plants seems best regarded at varietal status as *A. canescens* var. *occidentalis* (Torr. & Frem.) Welsh & Stutz comb. nov. [based on: *Pterchiton occidentale* Torr. & Frem in Frem. Rep. Rocky Mts. 318. 1846, type from the Great Salt Lake, and the autonym var. *occidentalis* established by *Obione occidentalis* var. *angustifolia* Torr. in Emory Bot. Mex. Bound. 2 (1):189. 1859]. A second more or less distinctive phase occurs

within the distribution of var. *occidentalis*, but is restricted ecologically and differs morphologically from that variety. These dune plants were noted by Hanson (1962) as having bracts to 25 mm wide and elongated internodes. To these features can be added the presence of adventitious roots at buried internodes and a diploid chromosome number of $2n=18$. They are here designated as var. *gigantea* Welsh & Stutz var. nov. Ab *Atriplex canescens* var. *occidentalis* in bracteis majoribus internodiis longioribus radicibus adventitiis et chromosomatibus $2n=18$ differt. TYPE: USA Utah. Juab County; Lynndyl sand dunes, T35S, R4W, 8 Sept. 1965, S. L. Welsh & G. Moore 5126 (Holotype BRY; two isotypes distributed previously as *A. canescens*). Plants of var. *gigantea* grow in interdune valleys, where they are encroached upon by the following dune. They survive being buried as the dune advances by producing adventitious roots along the stem and by continued growth above the encroaching sand. The species is an important browse plant for both wildlife and domestic livestock. It is used in reclamation projects and might be found established at sites beyond its usual range and habitat latitude.

Atriplex confertifolia (Torr. & Frem.) Wats. Shadscale [*Obione confertifolia* Torr. & Frem. in Frem., type from Weber County; *A. collina* Woot. & Standl.]. Dioecious spinose shrubs, 3–8 dm tall; leaves persistent, alternate, with petioles 1–4 mm long; blades 9–25 mm long, 4–20 mm wide, orbicular to ovate, elliptic, or oval, entire, obtuse apically; staminate flowers yellow, in clusters 2–4 mm wide or in spikes to 1 cm long; inflorescence panicle, 3–15 cm long; fruiting bracts sessile or subsessile, suborbicular to rhombic or elliptic, 4–12 mm long and wide, the surface smooth, lacking appendages; terminal teeth distinct, foliaceous, shorter than the bracts, entire or toothed below, spreading at maturity; seeds 1.5–2 mm broad. $2n=18$, 36, or higher. Gravelly to fine-textured soils in greasewood, mat-atrilex, other salt desert shrub, sagebrush, and pinyon-juniper communities at 850 to 2140 m, known in all Utah counties except Morgan, Rich, and Summit; Oregon east to North Dakota, south to California, Arizona, New Mexico, and Texas; 144

(xii). Shadscale forms hybrids with *A. canescens*, *A. garrettii*, *A. corrugata*, and *A. gardneri* varieties. This is a valuable browse plant for wildlife and livestock, especially sheep.

Atriplex corrugata Wats. Mat-saltbush; Mat-atrilex. Dioecious, low, spreading shrubs, mainly 3–15 cm tall and 3–15 dm broad; leaves persistent, sessile, opposite below, alternate above, 3–18 mm long, 1–6 mm wide, linear to linear-oblongate, or oblong, entire, obtuse apically; staminate flowers yellow to brownish, in clusters 3–6 mm wide, borne in spikes 1–8 cm long; pistillate flowers in leafy bracteate spikes 5–15 cm long; fruiting bracts sessile or subsessile, 3–5 mm long, 4–6 mm wide, densely tuberculate (or smooth), entire or undulate, rounded to acute apically; seeds ca 1.5 mm wide. $2n=36$. Saline, usually fine-textured substrates derived from Mancos Shale, Tropic Shale, Morrison, Duchesne River, and other similar formations in mat-atrilex and Castle Valley saltbush communities at 1220 to 2150 m in Carbon, Emery, Garfield, Grand, Kane, San Juan (?), and Uintah counties; New Mexico and Colorado; 105 (viii). Mat-saltbush is known to form intermediates with both *A. confertifolia* and *A. gardneri* var. *cuneata*. This saltbush is a valuable browse plant on the sparsely vegetated clays and silts of eastern Utah, where it is often the only woody vegetation present.

Atriplex elegans (Moq.) D. Dietr. Wheel-scale Orach. [*Obione elegans* Moq.]. Annual herbs, the stems erect to ascending or prostrate-decumbent, mainly 1–6 dm tall, scurfy to glabrate; leaves mostly alternate, subsessile or shortly petiolate, 5–30 mm long, 2–8 mm wide, elliptic to spatulate, oblongate, oblong, or obovate, the base cuneate, entire to denticulate, densely scurfy; flowers monoecious, in axillary clusters; staminate flowers with a 3–5 parted perianth; fruiting bracts shortly stalked, compressed, united except at the thin margin, orbicular, 2–4 mm wide, the margins dentate, the terminal teeth often prominent, the faces smooth; seeds 1–4 mm wide, brown. Disturbed sites at ca 885 m in Washington County; California, Nevada, Arizona, New Mexico, Texas, and Mexico; 3 (0).

Atriplex gardneri (Moq.) D. Dietr. Gardner Saltbush. [*Obione gardneri* Moq.; *A. nuttallii* Wats.]. Dioecious or monoecious shrubs

or subshrubs, 1–10 dm tall, unarmed; leaves more or less persistent, alternate or opposite to subopposite, sessile to petiolate, linear to oblanceolate, obovate, spatulate, or orbicular, 5–55 mm long, 2–25 mm wide, entire (rarely dentate), retuse to obtuse or rounded apically; staminate flowers in spikes or panicles, 2–30 cm long, yellow or brown, in clusters 2–4 mm wide; pistillate flowers in spikes or panicles to 30 cm long; fruiting bracts 3–9 mm long, 2–9 mm wide, bearing tubercles or wings or the tubercles alligned in 4 rows or rarely smooth, the apex toothed and usually with 2 or more lateral teeth; seeds 1.5–2.5 mm wide, tan or brown. This is a widely distributed complex of intergrading genotypes of great plasticity. Plants of this complex occur commonly in saline fine-textured substrates in much of the western Great Plains and in the intermountain region. Diploids,

triploids, tetraploids, and hexaploids (and higher polyploids, all multiples of the base number 9) are known within the complex, and hybrids are known between the constituents and the other woody species they contact, i.e., *A. canescens*, *A. confertifolia*, and *A. corrugata*. The treatment essentially follows the alignment of taxa suggested by Hanson (1962), with the exception that they are reduced to varietal status and var. *bonnevilleensis* is placed within the *gardneri* phase and not with *A. canescens*. The use of the epithet *nuttallii* for this complex was reviewed by Hanson (1962), and, other problems aside, the name *A. gardneri* clearly has priority over *A. nuttallii* and must be used according to stipulations of the International Code. Within Utah there are six morphologically intergrading entities that seem worthy of taxonomic recognition.

- 1. Fruiting bracts with 4 lateral wings or rows of tubercles; plants of valley bottoms and playas in Juab and Millard counties *A. gardneri* var. *bonnevilleensis*
- Fruiting bracts lacking lateral wings, the tubercles, when present, often more or less aligned; plants of various distribution 2
- 2(1). Lower leaves opposite or subopposite; plants prostrate to ascending, in eastern Utah 3
- Lower leaves alternate; plants ascending to erect, of various distribution 4
- 3(2). Leaves mainly 10–25 mm wide, grayish green; bracts 5–9 mm wide, heavily tuberculate; plants of the Uinta and Navajo basins *A. gardneri* var. *cuneata*
- Leaves mainly 4–12 mm wide, green; bracts 2–5 mm wide, not tuberculate or the tubercles very short; plants of Daggett County *A. gardneri* var. *gardneri*
- 4(2). Staminate flowers mostly brown; fruiting bracts with apical teeth half united, lacking lateral teeth; plants of Great Basin and Rich County
..... *A. gardneri* var. *falcata*
- Staminate flowers mostly yellow; fruiting bracts with apical teeth free, subtended by lateral teeth; plants of various distribution 5
- 5(4). Leaves mainly 5–15 times longer than wide; fruiting inflorescences spicate; plants of Grand County *A. gardneri* var. *welshii*
- Leaves mainly less than 5 times longer than wide; fruiting inflorescences paniculate; plants of broad distribution *A. gardneri* var. *tridentata*

Var. *bonnevilleensis* (C. A. Hanson) Welsh comb. nov. Bonneville Saltbush. [based on: *Atriplex bonnevilleensis* C. A. Hanson Studies Systematic Botany 1:2. 1962]. Greasewood communities in valley bottoms and playas at 1500 to 1585 m in Juab and Millard (type from Desert Experimental Range) counties; Nevada; 10 (i). $2n=18$. The Bonneville saltbush is apparently a partially stabilized in-

trogressant involving *A. gardneri* var. *falcata* and *A. canescens*. The habitat is intermediate between that of the parental taxa. There is evidence that the introgression is continuing in some populations at least.

Var. *cuneata* (A. Nels.) Welsh comb. nov. Castle Valley Saltbush. [based on: *Atriplex cuneata* A. Nels. Bot. Gaz. 34:357. 1902]. Saline, fine-textured substrates on Mancos

Shale, and other formations of similar texture and salinity, in greasewood and mat-atrilex communities at 1220 to 2170 m in Carbon, Duchesne, Emery (type from near Emery), Garfield, Grand, San Juan, and Uintah counties; Colorado and New Mexico; 166 (xxi). $2n=18, 27, 36,$ and higher. A series of at least partially stabilized introgressants between var. *cuneata* and var. *tridentata* in Carbon County form the basis of *A. cuneata* ssp. *introgressa* C. A. Hanson. Possibly they warrant taxonomic recognition, but no nomenclatural combination is intended or implied herein.

Var. *falcata* (Jones) Welsh comb. nov. Jones Saltbush. [based on: *Atriplex nuttallii* var. *falcata* Jones Contr. W. Bot. 11:19. 1903]. Sagebrush, shadscale, and greasewood communities at 1310 to 1985 m in Box Elder, Iron, Juab, Millard, Rich, and Tooele counties; Washington to Montana, south to Nevada and Wyoming; 30 (i).

Var. *gardneri* Gardner Saltbush. Greasewood and sagebrush-saltbush communities at ca 1895 m in Daggett County; Wyoming, Colorado, and Montana; 6 (0).

Var. *tridentata* (Kuntze) Macbr. Basin Saltbush. [*A. tridentata* Kuntze; *A. nuttallii* var. *utahensis* Jones, type from Salt Lake City]. Greasewood, shadscale, alkali saccaton, kochia, saltgrass, and sedge-rush communities at 1280 to 1985 m in Beaver, Box Elder, Cache, Carbon, Davis, Duchesne, Iron, Juab, Millard, Piute, Salt Lake, Sanpete, Sevier, Tooele, and Uintah counties; Colorado, Nevada, Idaho, and Wyoming; 95 (iv). $2n=18, 36, 54.$ Materials from eastern Utah have leaves narrower on the average than those from the Great Basin. The bracts are more heavily tuberculate also.

Var. *welshii* (C. A. Hanson) Welsh comb. nov. Welsh Saltbush. [based on: *Atriplex welshii* C. A. Hanson Studies Systematic Botany 1:1. 1962]. Mat-saltbush and Castle Valley saltbush communities at 1280 to 1315 m in Grand County; endemic; 10 (ii). $2n=18.$

***Atriplex garrettii* Rydb.** Garrett Saltbush [*A. canescens* ssp. *garrettii* (Rydb.) H. & C.; *A. canescens* var. *garrettii* (Rydb.) Benson]. Dioecious (rarely monoecious) shrubs or subshrubs, mainly 2–6 dm tall, unarmed; leaves opposite or subopposite below, petiolate, the blades 8–55 mm long, 6–32 mm wide, ovate

to obovate, elliptic, or orbicular, yellow-green, sparingly scurfy, entire or repand-dentate, obtuse to cuneate basally, rounded to acute apically; staminate flowers brown to tan (rarely yellow), in clusters 2–4 mm wide on panicles 2–8 cm long; pistillate flowers in spikes or spicate panicles 4–30 cm long; fruiting bracts 6–10 mm long and wide, winged, the surface smooth, reticulate, or with flattened processes, toothed apically; seeds ca 2 mm wide, brown. $2n=18.$ Shadscale, ephedra, eriogonum, blackbrush, and mixed shrub-grass communities on talus slopes of canyons of the Colorado at 1125 to 1895 m in Garfield, Grand (type from near Moab), Kane, San Juan, and Wayne counties; endemic; 41 (xii). $2n=18.$ This distinctive plant has been regarded as a portion of the variation within an expanded *A. canescens*, with which it shares the feature of 4-winged pistillate fruiting bracts, but it is possibly more closely allied with *A. confertifolia*, with which it hybridizes.

***Atriplex graciliflora* Jones** Blue Valley Orach. Monoecious annual herbs, mainly 1–3 dm tall, branching from the base; leaves alternate, petiolate, the blades 8–10 mm long and about as wide or wider, cordate-ovate to orbicular, cordate, or deltoid, truncate to cordate basally, rounded to obtuse or acute apically, entire; staminate flowers in panicles overtopping the foliage, the perianth 5-lobed; pistillate flowers axillary; fruiting bracts samaralike, 6–16 mm wide, stipitate, compressed, orbicular, oblong or cordate in outline, winged, the wings undulate or entire, the surfaces smooth; seeds ca 3 mm wide, dull white. Saltbush, seepweed, greasewood, rabbitbrush, and tamarix communities on saline, often salt-encrusted, soils at 1125 to 1900 m in Carbon, Emery, Garfield, Kane, and Wayne (type from Blue Valley) counties; Colorado; 18 (iii).

***Atriplex heterosperma* Bunge** Two-seed Orach. Monoecious annual herbs, mainly 1.5–14 dm tall, erect, branched from below the middle or above; leaves opposite or subopposite below, commonly alternate above and petiolate, the blades mainly 15–80 mm long and as wide or wider, hastately lobed, triangular, the base truncate to cordate or obtuse, acute apically; staminate flowers with

5 sepals; fruiting bracts 2–7 mm long, orbicular to suborbicular or ovate, entire, the surfaces smooth, dimorphic, the larger with a pale brown vertical seed 2–3 mm wide, the smaller with a shiny black vertical seed ca 1 mm wide. $2n=36$. Riparian and palustrine (less commonly ruderal) habitats in greasewood, saltgrass, cocklebur, tamarix, cottonwood, and rush-cattail communities at 1310 to 1985 m in Box Elder, Cache, Davis, Duchesne, Emery, Juab, Salt Lake, Sanpete, Sevier, Summit, Uintah, and Weber counties; western North America; adventive from Eurasia; 29 (ii). This is a handsome vigorous annual that appears to be invading saline lowland and other disturbed areas throughout the state.

Atriplex hortensis L. Garden Orach. Monoecious annual herbs, mainly 5–20 dm tall, erect, branching from the middle or above; leaves opposite or subopposite below, alternate above, petiolate, the blades commonly 1.5–13.5 cm long and 1–13 cm wide, ovate to lanceolate, not especially hastate, the base acute to cordate, acute to rounded apically; staminate flowers with 3–5 sepals; pistillate flowers dimorphic, the pistil vertical and enclosed in bracts or the pistil horizontal and enclosed in a 4- or 5-lobed calyx, both shortly pedicellate; fruiting bracts 8–19 mm long, orbicular to ovate, entire, the surfaces smooth, greenish or reddish; seeds dimorphic, either 2–4 mm wide and brown or ca 1 mm wide and black. Disturbed sites in riparian and ruderal habitats at 1310 to 2135 m in Cache, Duchesne, Salt Lake, Sanpete, Summit, Tooele, Uintah, and Utah counties; practically cosmopolitan, introduced from Eurasia; 12 (i). This plant is grown as a potherb, and is to be expected practically anywhere. It persists and escapes following cultivation.

Atriplex hymenelytra (Torr.) Wats. Desert Holly. [*Obione hymenelytra* Torr.]. Dioecious shrubs, 3–15 dm tall or more, unarmed; leaves persistent, petiolate, alternate, the blades 10–40 mm long and as wide or wider, orbicular to reniform or oval, greenish to silvery white, permanently scurfy, prominently dentate; staminate flowers yellow to purple-brown, in clusters 3–4 mm thick, borne in panicles to 3 cm long; pistillate bracts subsessile, 7–10 mm long and wide, orbicular to reniform, the margins entire to crenate; seeds

ca 2 mm wide, brown. Warm desert shrub community at ca 730 m in Washington County; Arizona, Nevada, California, and Mexico; 4 (0). This is a handsome rounded shrub with silvery white foliage. It flowers very early in springtime.

Atriplex lentiformis (Torr.) Wats. Big Saltbush. [*Obione lentiformis* Torr. in Sitgr.]. Dioecious or, less commonly, monoecious shrubs, mainly 10–25 dm tall, unarmed; branchlets terete; leaves persistent, alternate, petiolate, the blades 0.5–4 cm long, 0.3–3 cm wide, deltoid to rhombic, ovate, or oblong-elliptic, gray-green, scurfy, entire to repand or subhastately lobed, rounded to obtuse apically; staminate flowers yellow, in clusters 1–2 mm wide, borne in panicles 0.5–5 dm long; fruiting bracts 3–4 mm long and wide, sessile, orbicular to oval, crenulate, rounded apically; seeds ca 1–1.5 mm wide, brown. Drainages, stream and canal banks, and roadsides in warm desert shrub communities at 760 to 950 m in Washington County; Arizona, Nevada, California, and Mexico; 8 (0).

Atriplex obovata Moq. New Mexico Saltbush. Dioecious shrubs, mainly 2–8 dm tall; leaves tardily deciduous, alternate, shortly petiolate, the blades 8–30 mm long, 6–20 mm wide, obovate to elliptic or orbicular, gray-green, entire or rarely dentate, rounded to retuse or obtuse apically; staminate flowers yellow, in clusters 2–3 mm wide, borne in panicles 6–30 cm long; fruiting bracts 4–5 mm long, 5–9 mm wide, sessile, broadly cuneate, the surfaces smooth or rarely tubercled, the margins entire, the apical tooth subtended by 2–6 equal or smaller teeth; seeds 1–1.5 mm wide, brownish. Salt desert shrub and lower pinyon-juniper communities at ca 1525 to 1650 m in San Juan County; Arizona, New Mexico, and Mexico; 6 (i).

Atriplex patula L. Fat-hen Saltbush. Monoecious annual herbs, mainly 1.5–10 dm tall, prostrate-ascending or erect, simple or branched; leaves alternate or some or all opposite, petiolate, the blades mainly 1–12 cm long, 1–5 cm wide or more, ovate, deltoid, lance-ovate, or lance-linear, cordate to hastate, truncate, or acute to cuneate basally, rounded to obtuse or acute apically, entire to dentate or hastate, thin or thick, green, glabrous or scurfy; flowers in paniculate

clusters; staminate flowers with 4 or 5 sepals; fruiting bracts sessile, subsessile, or rarely stipitate, 2–12 mm long, 3–9 mm wide, deltoïd to ovate or rhombic, sometimes spongy-thickened, the margin entire or denticulate, the face smooth, roughened, or tuberculate; seeds vertical, dimorphic, either black and 1–2 mm wide or brown and 1–3 mm wide. This species complex consists of plants with

- 1. Principal lower leaves triangular-hastate; leaf bases truncate, broadly cuneate, or subcordate; plants common *A. patula* var. *triangularis*
- Principal lower leaves various, but seldom hastate; leaf bases acute to cuneate; plants uncommon *A. patula* var. *patula*

Var. *patula*. Sedge-reed, tamarix-Russian olive, and willow-cottonwood communities at 1370 to 1985 m in Rich, Sanpete, and Utah counties; widespread in North America; Eurasia; 3 (i). Materials tentatively assigned here are thin-leaved, but bracts vary in outline from rhombic to ovate or narrowly oblong and the surfaces from smooth to tubercled.

Var. *triangularis* (Willd.) Thorne & Welsh comb. nov. [based on: *Atriplex triangularis* Willd. Sp. Pl. 4:936. 1805; *A. hastata* authors, not L.; *Chenopodium subspicatum* Nutt.; *A. subspicata* (Nutt.) Rydb.; *A. carnosa* A. Nels.]. Saltgrass, sedge-rush, rush-cattail, and other palustrine and riparian habitats, usually in saline mucky soils at 850 to 1985 m in Cache, Davis, Duchesne, Emery, Millard, San Juan, Salt Lake, Sanpete, Uintah, and Washington counties; widely distributed in North America; Europe; 31 (v). Both thick and thin-leaved specimens are included in this variety. The problem of typification of *A. hastata* L. was reviewed by Taschereau (Canad. J. Bot. 50:1585, 1972). That name evidently replaces the long-established *A. calotheca* (Rafn.) Fr., a plant not known from Utah. The next available epithet at specific rank is apparently *A. triangularis* Willd., herein treated at varietal level. It seems likely that another name might well supersede that name at varietal rank.

***Atriplex powellii* Wats.** Powell Orach. Dioecious (sparingly monoecious) annual herbs; stems slender to stout, mainly 1–5 (7) dm tall, branching almost throughout; herbage pubescent with scurfy and arachnoid

circumboreal representation. Our material apparently consists of introduced and indigenous portions of that complex, often treated at specific status or in various infraspecific categories. Treatment as a broad, highly variable taxon consisting of two infraspecific taxa seems to best represent our material. The following key will serve to segregate most specimens.

hairs; leaves alternate, petiolate, or the upper sessile, the blades 0.4–5 cm long, 0.2–3 cm wide, ovate to rhombic or elliptic, entire, rounded to cuneate basally, acute to obtuse apically, prominently 3-veined; staminate flowers with calyx 4- or 5-lobed; fruiting bracts sessile, 2–2.8 mm long, 1.5–3.2 mm wide, thick, united to the apex, ovate to oblong or broadly cuneate, truncate to cuspidate apically, the surfaces with thickened processes or rarely smooth; seeds ca 2 mm long, greenish. Saline, usually fine-textured substrates, in greasewood, rabbitbrush, shadscale, seepweed, mat-atriplex, juniper-pinyon, and blackbrush communities at 1220 to 1830 m in Carbon, Duchesne, Emery, Garfield, Grand, Kane, Sanpete, Sevier, Tooele, Utah, and Wayne counties; Montana and South Dakota to Arizona and New Mexico; 54 (ix). This is the only annual atriplex in Utah that approaches being truly dioecious, but occasionally a few flowers of the opposite gender occur, resulting in sparingly monoecious individuals. The species in Utah is characteristic of the Colorado Drainage system. The few specimens from the Great Basin possibly represent recent introductions.

***Atriplex rosei* L.** Tumbling Orach. Monoecious, coarse, annual herbs; stems simple or more commonly branching throughout, mainly 2–8 dm tall; herbage scurfy to glabrate; leaves alternate, petiolate, the blades mainly 1.2–7 cm long, 0.6–3.5 cm wide, ovate to lanceolate, acute to obtuse apically, irregularly dentate and often subhastately lobed; staminate flowers with 4 or 5 sepals; fruiting bracts sessile, 4–6 (8) mm long and as

wide, ovate to rhombic, united to the middle, dentate, sharply tuberculate on the surfaces; seeds dimorphic, brown and 2–2.5 mm wide, or black and 1–2 mm wide. Widely established weedy species of disturbed sites, often in riparian habitats or in barnyards or on animal bedgrounds, at 850 to 2560 m in all or nearly all Utah counties; widespread in North America; Eurasia and elsewhere; 47 (v).

Atriplex saccaria Wats. Stalked Orach. Low monoecious herbs, forming rounded clumps, mainly 0.5–2 (2.5) dm tall; stems usually branched from the base; herbage scurfy;

1. Pedicels of fruiting bracts 3–8 mm long or more, the bracts all essentially alike; plants uncommon *A. saccaria* var. *caput-medusae*
 — Pedicels of fruiting bracts mainly less than 3 mm long, the bracts of lower axils tending to be sessile and less tubercled than the upper ones
 *A. saccaria* var. *saccaria*

Var. *caput-medusae* (Eastw.) Welsh comb. nov. [based on: *Atriplex caput-medusae* Eastw. Proc. Calif. Acad. II. 6:316. 1896; *A. argentea* var. *caput-medusae* (Eastw.) Fosberg]. Medusa-head Orach. Greasewood, saltbush, and other salt-desert shrub communities at ca 1525 to 1600 m in Emery, San Juan (type from Recapture Creek), and Uintah counties; New Mexico and Arizona; 3 (i).

Var. *saccaria* [A. *cornuta* Jones, type from Green River]. Mat-atriples, shadscale, greasewood, and pinyon-juniper communities at 1125 to 1830 m in Carbon, Daggett, Emery, Garfield, San Juan, Uintah, and Wayne counties; Wyoming to Arizona and New Mexico; 30 (vi).

***Atriplex semibaccata* R. Br.** Australia Saltbush. Decumbent, monoecious subshrubs, mainly 5–30 cm high and to 1 mm wide or more, unarmed; leaves alternate subsessile or shortly petiolate, mainly 0.8–3 cm long, 4–9 mm wide, obovate to oblong, remotely dentate, obtuse apically, attenuate basally, 1-veined; staminate flowers in clusters ca 1.5 mm wide; fruiting bracts sessile, 3–6 mm long and as wide, rhombic, united below, convex, red-fleshy at maturity, obtuse to acute apically, strongly veined; seeds dimorphic, ca 1.5 mm long and black, and ca 2 mm long and brown. Disturbed sites at ca 850 m in Washington County; southeastern U.S.; introduced from Australia; 5 (0).

leaves alternate or the lowermost subopposite, petiolate, the blades mainly 0.6–4 cm long, 0.4–3 cm wide, ovate to deltoid-ovate or oval, entire or in some the base subhastately lobed, truncate to subcordate or broadly cuneate basally, acute to rounded apically; staminate flowers with 5-parted perianth; fruiting bracts stipitate, or some subsessile to sessile, the faces smooth to coarsely tubercled or appendaged, mainly 4–6 mm long and as wide; seeds 2–3 mm wide, brownish to whitish. Two rather continuously intergrading varieties are present.

***Atriplex torreyi* Wats.** Torrey Saltbush. Dioecious shrubs, mostly 8–30 dm tall, forming broad clumps; branchlets angled, becoming bluntly thorny; leaves alternate, persistent, with petioles 1–4 mm long, the blades 0.5–3 cm long, 4–16 mm wide, ovate to deltoid, rhombic, oval, or lanceolate, entire (rarely toothed), obtuse apically, truncate to obtuse basally; staminate flowers yellow, in clusters ca 1 mm wide, in panicles mainly 1–3 dm long; fruiting bracts sessile, 2–3 mm long and wide, orbicular, crenate, rounded apically; seeds ca 1–1.4 mm wide, brown. Mesquite, creosote bush, shadscale and blackbrush communities at ca 800 to 900 m in Washington County; Nevada and California; 13 (0).

***Atriplex truncata* (Torr.) Gray** Wedge Orach. [*Obione truncata* Torr. in Wats.; *A. subdecumbens* Jones, type from Fish Lake, Sevier County]. Monoecious annual herbs; stems simple or more commonly branched throughout, mainly 3–8 dm tall; herbage scurfy, becoming glabrate; leaves alternate, petiolate below, sessile above, the blades mainly 4–30 mm long, 3–30 mm wide, ovate to deltoid or oval, acute to obtuse apically, entire or dentate, truncate or subhastate to rounded basally; staminate flowers with 4 or 5 sepals; fruiting bracts sessile, 2–3 mm long and as wide, broadly cuneate, truncate apically, with 3 (or more) teeth across the

summit, the surfaces smooth (rarely tubercled); seeds 1–2 mm wide, brown; $2n = 18$. Saline saltgrass-greasewood and other palustrine habitats at ca 850 to 1375 (2700) m in Box Elder, Cache, Carbon, Emery, Juab, Millard, Rich, Salt Lake, Sevier, Utah, Washington, and Wayne counties; British Columbia to Montana, south to California and New Mexico; 12 (0).

Atriplex wolfii Wats. Slender Orach. [*A. tenuissima* A. Nels., type from Gunnison]. Monoecious, slender, delicate, annual herbs; stems simple or more commonly branched throughout, mainly 0.7–3.5 dm tall; herbage scurfy; leaves alternate, sessile, mainly 0.4–2.5 cm long, 1–3 mm wide, linear to narrowly lanceolate; staminate flowers with 5 sepals; fruiting bracts sessile, 1.5–3 mm long, 1–2.5 mm wide, ovate to cuneate in outline, truncate to attenuate apically, the faces smooth or tuberculate; seeds 1–2 mm long, brown. Greasewood community at 1525 to 2135 m in Carbon, Duchesne, Emery, Garfield, Piute, Sanpete, Sevier, and Uintah counties; Wyoming and Colorado; 7 (ii).

BASSIA All.

Annual herbs; leaves alternate, entire, sessile; herbage pilose or tomentose, at least in inflorescence; flowers perfect and pistillate, glomerate or solitary in leaf axils and in short axillary spikes, bracteate; calyx 5-lobed, depressed-globose, enclosing the fruit and usually prominently armed with a curved or hooked spine on the dorsal surface of each lobe; stamens 5, hypogynous; styles 1, with 2 (3) stigmas; fruit compressed; seed horizontal.

Bassia hyssopifolia (Pallas) Kuntze [*Salsola hyssopifolia* Pallas; *Echinopsilon hyssopifolius* (Pallas) Moq. in DC.; *Kochia hyssopifolia* (Pallas) Schrad.]. Annual herbs, the main stem erect, the lower lateral ones often decumbent, 2–10 dm tall; herbage more or less lanate, especially in inflorescence; leaves 4–40 mm long, 1–5 mm wide, linear to oblong narrowly oblanceolate; flowers clustered in terminal or lateral spikes, or solitary in leaf axils; floral bracts reduced; pistillate and sterile flowers mixed with perfect ones; fruiting calyx ca 2 mm wide, each lobe with a stout curved to uncinately spine; pericarp

membranous, planoconvex. Commonly on saline substrates, often in riparian or palustrine habitats, in saltgrass, greasewood, horsebrush, shadscale, and cottonwood-tamarix communities at 850 to 2380 m in most, if not all, Utah counties; adventive from Eurasia; 34 (vii). This species forms apparent intergeneric hybrids with *Kochia scoparia*, from which *Bassia* differs in having spines on the sepals instead of horizontal flattened processes, inter alia.

BETA L.

Glabrous annual or biennial herbs; leaves alternate, petiolate, essentially entire; flowers perfect, solitary or borne in few-flowered cymes, these arranged in spicate terminal or axillary spikes; sepals 5; stamens 5; ovary partially inferior, connate with receptacle in fruit; stigmas 2 or 3; fruits adhering, fused by the swollen perianth and receptacle; seeds horizontal.

Beta vulgaris L. Stems mainly 4–10 dm tall or more; basal leaves well developed, long-petiolate, the blades mainly 5–25 cm long, 2–10 cm wide, undulate-crisped; inflorescence elongate, with lower bracts prominent; sepals incurved in fruit. Cultivated food plant, occasionally escaping but not persisting, mainly below 2135 m in much of Utah; introduced from Europe; 7 (0). This is the beet of commerce, including the red table beet and sugar beet. The latter was a major cash crop in Utah until the 1960s. Swiss chard, grown for use as a potherb, is a cultivar of this species.

CERATOIDES Gagnebin

Monoecious tomentose shrubs; leaves alternate, entire; staminate flowers ebracteate, with calyx 4-lobed; stamens 4; pistillate flowers lacking a perianth, enclosed in 2 villous-pilose, partially connate bracteoles, the tips divergent and hornlike; styles 2, slender; pericarp thin, free from the seed. [*Eurotia* Adans.; *Krascheninnikovia* Gueldenstaedt].

HOWELL, J. T. A new name for winterfat. *Wasmann J. Biol.* 29:105. 1971.

Ceratoides lanata (Pursh) J. T. Howell Winterfat; White-sage. [*Diotis lanata* Pursh; *Eurotia lanata* (Pursh) Moq.]. Shrubs, woody

for 0.2–8 dm above ground (or more), and with numerous annual branchlets mainly 0.5–3 (5) dm long; herbage stellate-hairy, commonly with longer straight hairs intermixed, the hairs white or becoming yellowish in age; leaves 1–4.5 cm long, 1–6.5 mm wide, linear to narrowly lanceolate, entire, revolute to almost flat, sessile above, short-petiolate below; flowers borne in dense axillary clusters or more or less spicate along branch tips; pistillate flowers 2–4 per axil; staminate flowers in spicate axillary clusters, the perianth segments 1.5–2 mm long; fruiting bracts 3–6 mm long, obscured by the long covering hair. Shadscale, black sagebrush, sagebrush, bullgrass, sagebrush, and pinyon-juniper communities at 730 to 2840 m, known in all Utah counties except Salt Lake, Summit, Davis, Morgan, and Weber; Yukon to Saskatchewan, south to California, New Mexico, and Texas; 105 (ix). Three weakly differentiated morphological phases of winterfat are present in Utah. The common and most widely distributed phase (*var. lanata*) is woody only at the base, has erect annual growth, and is moderately long-hairy as well as stellate. In Washington County and to a lesser extent in Kane County (mainly along Lake Powell) is a definitely woody plant with divaricate branches, which tend to persist as blunt thorns. The pubescence consists of a preponderance of stellate hairs, with few or none of the long slender ones being present. These plants are known as *var. subspinosa* (Rydb.) J. T. Howell [*Eurotia subspinosa* Rydb., type from Washington County]. A third phase is present in Grand and San Juan counties, where it grows in sandy parks surrounded by monoliths. The stems are woody for a distance of up to 8 dm or more, but the branching or current annual growth is erect as in *var. lanata* and the pubescence is intermediate between that of *var. subspinosa* and *var. lanata*. This latter plant is here designated as *var. ruinina* Welsh *var. nov.* Similis *Ceratoides lanata* *var. lanata* in ordinatam ramifacatam sed caulibus lignosis usque ad 8 dm altis et pubescentibus longis paucioribus differt. TYPE.—USA. Utah. San Juan County; T32S, R18E, S13, Beef Basin, Ruin Park, 2013 m elev., parkland in pinyon-juniper community on sand alluvium, 2 August 1983, S. L. Welsh & B. T. Welsh 22377 (Holotype

BRY; isotypes NY; US; CAS; POM). Additional specimens: Utah. San Juan County; Chesler Park, T31S, R19E, S5, Sandy rolling grassland, fringed with juniper and pinyon, 1708 m elev., 14 Sept. 1964, S. L. Welsh, G. Moore, & M. Olsen 3730 (BRY); do, ca 15 mi SE of La Sal Jct., along power transmission line, sandy soil, Bouteloua grassland, 30 June 1970, L. C. Higgins 3550 (BRY). Grand County; Landscape Arch, Arches National Monument, 28 Sept. 1963, S. L. Welsh & G. Moore 2763 (BRY); do, near trail to Sand Dune Arch and Broken Arch, Arches National Park, 14 July 1972, J. S. Allan 130 (BRY). This variety, named for Ruin Park, is a striking phase of the species, with individuals in the populations exceeding 12 dm in height. All phases are considered as valuable browse plants for livestock, especially for sheep.

CHENOPODIUM L.

Annual herbs, glabrous, pubescent, glandular, or farinose (mealy); leaves alternate, flat, entire, toothed, or lobed; flowers perfect or some pistillate only, ebracteate, usually in cymes, variously arranged in spicate or paniculate inflorescences; calyx segments usually 4 or 5, persistent, flat or keeled, more or less covering the fruit, rarely becoming fleshy; stamens commonly 5; styles 2 (3); seeds lenticular, horizontal or vertical. Note: The genus is notoriously complex for several reasons. The floral features are greatly reduced and diagnostic characteristics are often based on either vegetative structures or on minutiae of calyx, pericarp, and seed coat, which are often subject to interpretation and might be demonstrated ultimately as trivial. Nomenclature is tangled both within the native and introduced entities, leading to taxonomic treatments that do not satisfactorily represent the taxa as represented by actual specimens. Further, there is variability within the diagnostic features leading to contradictory statements in taxonomic treatments, e. g., with regard to such characters as adherent versus nonadherent pericarps. Thus, the treatment presented below attempts to provide names for the taxa recognizable in Utah based on examination of actual specimens. The entities seem to be real, but the names might be misapplied in some cases.

BASSETT, I.J. AND C. W. CROMPTON. 1982. WAHL, H. A. 1954. A preliminary study of
 The genus *Chenopodium* in Canada, the genus *Chenopodium* in North
 Canad. J. Bot. 60:586-610. America. *Bartonia* 27:1-46.

- 1. Plants with yellow glands or glandular hairs, not farinose, aromatic 2
- Plants glabrous or farinose, eglandular, not aromatic 3
- 2(1). Flowers solitary in small cymes, these spreading-recurved along the axis of an
 elongate panicle; plants common *C. botrys*
- Flowers in small sessile clusters, borne in bracteate panicles; plants rare
C. ambrosioides
- 3(1). Seeds all, or at least some, vertical in the flowers (except sometimes in
C. glaucum, keyed both ways) 4
- Seeds usually all horizontal 6
- 4(3). Leaves mainly 0.5-2 cm long, 2-7 mm wide, irregularly dentate, glaucous-
 farinose beneath *C. glaucum*
- Leaves mainly larger and often hastately lobed, green or reddish beneath 5
- 5(4). Flowers in elongate axillary clusters, these forming erect or steeply ascending
 compact panicles; plants commonly palustrine *C. rubrum*
- Flowers in subglobose axillary clusters, these forming bracteate spikes; plants
 usually montane *C. capitatum*
- 6(3). Leaves 0.5-2 mm long, 2-7 mm wide, sinuate-dentate, glaucous-farinose
 beneath *C. glaucum*
- Leaves various, but not simultaneously as above 7
- 7(6). Larger cauline leaves more or less cordate to truncate basally, often over 4 cm
 wide, glabrous; sepals not keeled dorsally; panicles large and open *C. hybridum*
- Larger cauline leaves with bases various, but seldom as above, and less than 4
 cm wide, often farinose beneath; sepals usually keeled 8
- 8(7). Larger cauline leaf blades mainly 3-5 or more times longer than wide, entire
 or with a pair of basal lobes 9
- Larger cauline leaf blades mainly 1-3 times longer than broad, hastately lobed,
 toothed, or entire 10
- 9(8). Leaves 1-veined, linear, entire; pericarp adherent to the seed *C. leptophyllum*
- Leaves 3-veined (at least near the base in larger ones), entire or with 2 basal
 lobes; pericarp not adherent to the seed *C. dessicatum*
- 10(8). Leaf blades hastately lobed (the lobe sometimes again lobed or toothed), or
 oval to elliptic and entire, or rarely with one or more teeth on the apical larger
 lobe; calyx lobes obscurely or narrowly membranous-margined; plants
 indigenous 11
- Leaf blades sinuate dentate, ovate to lanceolate, or entire; calyx lobes with
 broad scarious margins; plants adventive 12
- 11(10). Leaf blades not hastately lobed; pericarp usually adherent; plants usually of
 upper middle to higher elevations *C. atrovirens*
- Leaf blades often hastately lobed; pericarp not adherent; plants of wide
 altitudinal range *C. fremontii*
- 12(10). Fruits sharply angled on the margin; seed coat with minute rounded pits;
 plants uncommon in Washington and Sevier counties *C. murale*
- Fruits rounded to obtuse on the margin; seed coat smooth to sculptured; plants
 common or uncommon, of various distribution *C. album*

Chenopodium album L. Lambsquarter; pigweed. Erect annual herbs, the stems red-striate, 1–10 dm tall or more, simple or more commonly branched; herbage more or less farinose, at least when young; leaves petiolate, the blades 1–6.5 cm long, 0.5–5.6 cm wide, ovate to rhombic-ovate or lanceolate, sinuate-dentate and often subhastately lobed

or the upper (rarely all) entire; flowers in dense glomerules, these spicate in upper axils; calyx with keeled lobes, enclosing the fruit; pericarp adherent; seeds horizontal, rounded marginally, smooth to sculptured, black, 1–1.5 mm wide. Two phases are present, which have been given taxonomic recognition.

- 1. Seeds sculptured, alveolate-reticulate, or reticulate *C. album* var. *berlandieri*
- Seeds smooth or faintly striate *C. album* var. *album*

Var. *album* Weedy species of disturbed habitats at 850 to 2265 m, probably in all Utah counties; widespread in North America; adventive from Eurasia; 53 (v). N = 27. This taxon has been confused with *C. fremontii*, q.v., but in those plants having mature fruits the adherent pericarps are diagnostic.

Var. *berlandieri* (Moq.) Mack. & Bush [*C. berlandieri* Moq.; *C. berlandieri* ssp. *zschackei* (Murr.) Zobel; *C. zschackei* Murr.] Weedy or pioneer plants of disturbed substrates in several plant communities at 1280 to 2585 m in Duchesne, Grand, Juab, Millard, San Juan, Sevier, and Utah counties; widespread in North America; 8 (v). N = 18. The specimen from Utah county (Welsh 3798 BRY) has the fruit nonadherent.

***Chenopodium ambrosioides* L.** Mexican-tea. Aromatic annual herbs; stems erect or ascending, mainly 4–10 dm tall; herbage pubescent and with sessile glands; leaves short-petioled, the blades 2–10 cm long, 3–30 mm wide (or more²), usually lanceolate, dentate to lacinate; inflorescence paniculate, the cymes sessile on ultimate branches, usually bracteate; calyx united to the middle or above; seeds 0.5–0.8 mm wide. Ruderal and garden weeds of Utah and Washington counties; widespread in tropical and temperate New World; adventive from Mexico; 2 (0).

***Chenopodium atrovirens* Rydb.** Mountain Goosefoot. [*C. fremontii* var. *atrovirens* (Rydb.) Fosberg; *C. hians* Standl.; *C. incognitum* Wahl]. Plants mainly 2–75 cm tall, the stems erect or steeply ascending, usually branched; herbage sparingly scurfy to glabrous; leaves petiolate, the blades 0.6–4 cm long, 2–23 mm wide, lanceolate to ovate, entire or obscurely hastately lobed, otherwise entire, obtuse basally; flowers clustered in leaf axils or in interrupted terminal spikes,

the lower ones subtended by foliose bracts, becoming ebracteate upward; perianth lobes free to below the middle, keeled dorsally; pericarp adherent or, less commonly, not adherent to the horizontal rugulose to smooth, obtusely margined seed; seeds ca 0.9–1.3 (1.5) mm wide. 2n = 18. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, Douglas fir, aspen-tall forb, and spruce-fir communities at 1705 to 3175 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Rich, Salt Lake, Sanpete, Sevier, Summit, Utah, and Wasatch counties; British Columbia to Saskatchewan, south to California, Nevada, Colorado, and Iowa; 24

(ii). Relationship of this species probably lies closer to the *leptophyllum* end of the spectrum. The occasional specimens with free pericarps might indicate intermediacy with *C. fremontii*, however. There has been little agreement between previous authors as to whether the pericarp was adherent or not, but in the specimens examined from Utah, the pericarps are usually adherent.

***Chenopodium botrys* L.** Jerusalem-oak. Aromatic annual herbs; stems commonly 1–5 dm tall, erect or ascending, usually branched; herbage glandular-villous; leaves petiolate, the blades sinuate-pinnatifid, the lobes again toothed or lobed, oblong to oval in outline; inflorescence an erect panicle of loosely spreading-recurved cymes, mainly shortly bracteate; sepals ca 1 mm long; seeds horizontal or vertical, 0.5–0.8 mm wide, dull, dark. 2n = 18. Widespread ruderal weedy species, established locally in indigenous communities, especially in gravelly washes at 760 to 1985 m in Beaver, Cache, Iron, Juab, Millard, Salt Lake, Sevier, Utah, and Washington counties; widely distributed in the U.S.; adventive from Eurasia; 22 (iii).

Chenopodium capitatum (L.) Asch. Strawberry-spinach. [*Blitum capitatum* L.; *C. overi* Aellen in Fedde?; *C. chenopodioides* authors, not (L.) Aellen]. Plants mainly 1–4 dm tall, the stems erect or decumbent-ascending, simple or more commonly branched from the base; herbage glabrous; leaves petiolate, the blades (1) 1.5–10 cm long, 1–10 cm wide, triangular-hastate to lanceolate, shallowly to deeply toothed or subentire, hastately lobed or the upper entire, acute to obtuse apically,

often turning reddish; flowers clustered in axillary capitate spikes, the lower clusters subtended by foliose bracts, the upper ones ebracteate or with reduced bracts; perianth lobes free to below the middle, not mealy, becoming fleshy and reddish, shorter than the fruit; pericarp adherent to the erect (or less commonly horizontal) seed; fruit ca 1 mm long. $2n=18$. Two varieties are present in Utah.

1. Flower clusters often over 5 mm wide, the calyx becoming red and fleshy at maturity; plants uncommon *C. capitatum* var. *capitatum*
- Flower clusters commonly less than 5 mm wide, the calyx not fleshy, though sometimes reddish at maturity; plants common *C. capitatum* var. *parvicapitatum*

Var. *capitatum* Gravelly soil in lodgepole pine forest, north slope of Uinta Mts. (Welsh & Moore 6696 BRY), Summit County; Alaska to Quebec, south to California, New Mexico, and New England; 1 (i).

Var. *parvicapitatum* Welsh var. nov. Similis *Chenopodio capitato* var. *capitato* sed in capitulis parvioribus et calycibus ecarosis differt. TYPE: USA. Utah. Beaver County; T27S, R6W, S35, Fish Lake Forest, Tushar Mountains, Indian Creek, ca 12 mi due NE of Beaver, 2288 m, mixed conifer-aspenside forest, igneous gravel, 28 June 1978, S. L. Welsh, M. Welsh, & E. Welsh 17148 (Holotype BRY; Isotypes seven, distributed previously as *C. rubrum* L.). Additional specimens: Utah. Garfield County; pass between Table Cliff Plateau and Escalante Mts., Beck & Tanner sn (BRY). Millard County; Canyon Mts., 6 mi SSW of Scipio, 11 June 1980, S. Goodrich 13993 (BRY). Grand County; ca 19 mi NNE of Thompson, Middle Willow Creek, 9 August 1977, S. Welsh & S. White 15853 (BRY). Summit County; Soapstone, 12 July 1928, W. P. Cottam 3779 (BRY). Wasatch County; Strawberry Valley, Mud Creek, 30 July 1964, V. B. Matthews 123 (BRY). Utah County; Mt. Timpanogos, Timpanogos Lodge area, 13 June 1974, K. Allred 854 (BRY). Mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1860 to 3050 m in Beaver, Cache, Carbon, Daggett, Duchesne, Garfield, Grand, Iron, Juab, Kane, Millard, Salt Lake, Sanpete, Summit, Tooele, Uintah, and Utah counties; British Columbia

to Saskatchewan, south to California, Nevada, and Colorado; 60 (xiv). This common plant of montane habitats has been identified variously as *C. capitatum* or *C. rubrum*, and, more recently, as *C. chenopodioides* (L.) Aellen. The latter plant is a portion of the flora of the Soviet Union and might represent nothing more than phases of *C. rubrum* sensu lato. Certainly the description provided for that entity (Flora SSSR 6:51.1936) is not of our specimens, and neither is the habitat cited (i.e., "wet solonchaks"). The name given here is for the purpose of providing an unequivocal epithet for this montane western American phase of *C. capitatum*.

Chenopodium dessicatum A. Nels. Desert Goosefoot. [*C. pratericola* Rydb.; *C. petiolare* var. *leptophylloides* Murr.; *C. leptophyllum* var. *dessicatum* (A. Nels.) Aellen; *C. leptophyllum* var. *oblongifolium* Wats.; *C. pratericola* var. *oblongifolium* (Wats.) Wahl]. Plants mainly 3–8 dm tall, the stems erect, simple or branched; herbage commonly more or less scurfy; leaves petiolate, the blades mostly 1.3–6 cm long and 2–10 (15) mm wide, linear to narrowly lanceolate or elliptic, entire or less commonly hastately lobed, cuneate basally; flowers clustered in terminal or axillary spicate panicles; perianth lobes free to below the middle, keeled dorsally; pericarp not adherent to the horizontal smooth to rugulose, obtusely margined seed; seeds 0.9–1.2 mm wide. $2n=18$. Shadscale, hopsage, rabbitbrush, tamarix-poplar, sagebrush, and pinyon-juniper communities at 850 to 1925 m in

Duchesne, Emery, Garfield, Grand, Kane, Salt Lake, San Juan, Uintah, Utah, Washington, and Wayne counties; Yukon to Manitoba, south to California, New Mexico, and Nebraska; 26 (iii). Material assigned to *C. dessicatum* in a strict sense, as distinct from *C. pratericola* in a strict sense, has perianth lobes covering the mature fruit, as opposed to having the fruit not covered. The distinction is not great. Reduction of this taxon to *C. leptophyllum* (as var. *oblongifolium*) begs the question of a probably nearer relationship to *C. fremontii*, with which it shares nonadherent pericarp and broader, more veined leaves. Furthermore, apparent intermediates between *C. fremontii* and *C. dessicatum* exist. The entire complex is in need of monographic study.

***Chenopodium fremontii* Wats.** Fremont Goosefoot. Plants mainly 1–8 (12) dm tall, the stems erect or ascending, usually branched; herbage more or less scurfy to glabrous; leaves petiolate, the blades 0.6–5 (6) cm long, and about as broad, less commonly 2–3 times longer than broad, triangular-ovate to ovate or lanceolate, commonly hastately lobed, the lobes often again lobed

or toothed, otherwise entire or rarely with 1 or few teeth on the main apical lobe, broadly cuneate to subcordate basally; flowers clustered in large terminal and smaller lateral spikes, scurfy; perianth lobes free to below the middle, keeled dorsally; pericarp not adherent to the horizontal, smooth to rugulose, obtusely margined seed; seeds 0.9–1.2 mm wide. N=9. This closely interrelated complex of forms involves the linear-leaved *C. leptophyllum* (q.v.) at one end of the spectrum and the broad-leaved phases of *C. fremontii* at the other end (and with both *C. atrovirens* and *C. dessicatum*, inter alia, between the extremes). The intervening plants have been regarded as species or some of them have been placed within expanded species concepts at both ends of the series. The course followed herein is a compromise between having one all-inclusive species, with numerous varieties, and that of recognition of all of the named entities at specific level. The proposed treatment attempts to represent the major taxa as they occur in Utah; the synonymy might not be properly applied in all cases.

1. Plants mainly less than 25 cm tall, branching from the base, the curved ascending branches subequal to the main stem; leaves more or less white-farinose, at least beneath *C. fremontii* var. *incanum*
- Plants 0.5–8 dm tall, variously branched, but if as above, the lateral branches much shorter than the main stem; leaves white-farinose to glabrous
..... *C. fremontii* var. *fremontii*

Var. *incanum* Wats. [*C. incanum* (Wats.) Heller; *C. watsonii* of authors, not A. Nels.?]. Blackbrush, salt desert shrub, pinyon-juniper, mountain brush, and ponderosa pine communities at 850 to 2350 m in Carbon, Duchesne, Emery, Garfield, Juab, Kane, Piute, Salt Lake, Tooele, Uintah, Wayne, and Washington counties; Nevada to Nebraska, south to Texas and Mexico; 28 (iii). The variety is transitional to the next.

Var. *fremontii* Blackbrush (and other warm desert shrub), salt desert shrub, sagebrush, mountain brush, pinyon-juniper, aspen, and spruce-fir communities at 850 to 3050 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Piute, Salt Lake, San Juan, Sevier, Summit, Tooele, Uintah, Utah, Washington, Wayne, and Weber counties; British Columbia to Manitoba,

south to California and Mexico; 63 (xix). Specimens assigned here are not uniform with regard to leaf shape, plant height, and openness of the inflorescence. More work is indicated.

***Chenopodium glaucum* L.** Oakleaf Goosefoot. [*C. salinum* Standl.]. Plants mainly 3–30 cm long, the stems prostrate to ascending or erect, usually branched; herbage farinose, especially on lower leaf surfaces; leaves shortly petiolate, the blades 4–25 mm long, 2–10 mm wide, lanceolate to oblong or ovate, coarsely sinuate-dentate; flowers in clusters in numerous short, bracteate or ebracteate, axillary spikes and a terminal spicate panicle; perianth cleft almost to base, not enclosing the fruit; pericarp not adherent to the seed; seeds horizontal or vertical, 0.8–1.3 mm wide, smooth. N=9. Often in saline substrates on

lake shores and stream banks, in sedge-rush, tamarix-sedge, rabbitbrush, pinyon-juniper, and aspen to spruce-fir communities at 1220 to 2745 m in Cache, Carbon, Duchesne, Garfield, Grand, Kane, Millard, Salt Lake, Sanpete, Sevier, Uintah, Utah, and Wayne counties; widespread in U.S. and Canada; Eurasia; 26 (xiv). Our material is assignable to *var. salinum* (Standl.) B. Boi., on the basis of its larger fruits (0.8–1.3 mm, not 0.6–0.9 mm).

Chenopodium hybridum L. Mapleleaf Goosefoot. [*C. gigantospermum* Aellen]. Plants mainly 2–10 dm tall, the stems erect, simple or branched; herbage glabrous, except in inflorescence; leaves alternate or the lower often opposite, long petiolate, the blades commonly 1.7–10 cm long, 1.2–10 cm wide, ovate to deltoid ovate, sinuate-dentate to -lobate, with 2–4 teeth or lobes, cordate to truncate or obtuse basally; flowers in small cymes, these arranged in large terminal and smaller axillary panicles, more or less farinose and often sparingly glandular; perianth cleft nearly to the base, not strongly keeled dorsally; pericarp not or moderately adherent; seeds 1.2–1.9 mm wide, with obtuse margin, smooth or somewhat sculptured. $2n = 18$. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen communities, less commonly in riparian or palustrine habitats, at 1280 to 2135 m in Beaver, Cache, Millard, Salt Lake, Sanpete, Summit, Tooele, Utah, and Weber counties; widely distributed in U.S. and Canada; Europe; 12 (iv). Our specimens have been identified as *var. gigantospermum* (Aellen) Rouleau, on the basis of the seed being less sculptured than in typical European material. Plants of this species formed huge stands in burned over sagebrush and aspen communities in Summit County in 1963.

Chenopodium leptophyllum (Moq.) Wats. Narrowleaf Goosefoot. [*C. album* var. *leptophyllum* Moq.]. Plants mainly 12–70 cm tall, erect or the branches ascending, simple or branched; leaves short-petiolate, the blades mainly 0.7–4 cm long, 1–5 (7) mm wide, linear to narrowly oblong or narrowly lanceolate, 1-veined, cuneate to acute basally, entire; flowers in loose to compact cymes aggregated into terminal or axillary spicate panicles; perianth lobes cleft to well below the middle, keeled dorsally; pericarp adherent; seeds horizontal, 0.9–1.1 mm wide, black, finely rugulose to smooth. $2n = 18$.

Shadscale, greasewood, rabbitbrush, tamarix, sagebrush, fringed sagebrush, mountain brush, and aspen communities at 1125 to 2900 m in Cache (?), Carbon, Daggett, Duchesne, Garfield, Grand, Piute, Salt Lake, San Juan, Summit, Tooele, Uintah, and Wayne counties; British Columbia to Saskatchewan, south to California and Mexico; 34 (xiii). The 1-veined, narrow leaf blades and adherent pericarps are apparently definitive for this plant.

Chenopodium murale L. Nettleleaf Goosefoot. Plants mainly 2–5 dm tall, the stems erect or with branches ascending; herbage glabrous or sparingly farinose, especially in inflorescences; leaves petiolate, the blades 1–5 (7) cm long and as broad or nearly so, ovate to oval or lanceolate, irregularly sinuate-dentate and some often subhastate, cuneate to subcordate basally; flowers sessile and solitary to clustered in axillary or terminal panicles not much, if at all, surpassing the leaves; perianth lobes free to below the middle, keeled dorsally; pericarp adherent to the horizontal, rugulose to smooth, sharply margined seed; seeds 1–1.5 mm long, $2n = 18$. Ruderal weeds at 730 to 1620 m in Sevier and Washington counties; widespread in U.S. and Canada; adventive from Eurasia; 5 (0).

Chenopodium rubrum L. Red Goosefoot. Plants mainly 0.5–10 dm tall, erect, simple or with steeply ascending branches; herbage glabrous or somewhat villous in inflorescence; leaves petiolate, the blades 0.7–9 cm long, 0.4–7 cm wide, triangular to ovate, lanceolate, or elliptic, sinuate-dentate or -lobed, some often subhastate, fleshy and often suffused with red; flowers sessile, the clusters borne in simple or branched axillary and terminal spicate panicles; perianth lobes cleft to the middle or below, rounded or sometimes keeled dorsally; pericarp not adherent; seeds nearly always vertical, oval in outline, 0.7–1 mm long, $2n = 18$. Saline moist substrates in palustrine and riparian habitats at 1280 to 2440 m in Box Elder, Cache, Daggett, Duchesne, Salt Lake, Uintah, and Utah counties; widespread in U.S. and Canada; Eurasia; 18 (i).

CORISPERMUM L.

Annual herbs, often pubescent with stellate hairs; leaves alternate, sessile, entire,

1-veined; flowers perfect, solitary or clustered in bract axils, arranged in dense or lax spikes; perianth segments 1-3, minute, unequal, the posterior one largest, erect, 1-nerved, scarious; stamens 1-3 (5); stigmas 2, connate basally; achenes strongly flattened, plano-convex, indurate, the margin winged or acute.

Corispermum villosum Rydb. Bugseed; tickseed. [*C. hyssopifolium* authors, not L.; *C. nitidum* authors, not Kit in Schult.; *C. imbricatum* A. Nels.; *C. emarginatum* Rydb.; *C. marginale* Rydb.; *C. simplicissimum* Lunel?]. Stems mainly 8-50 cm tall, commonly branched throughout, the lower branches often curved-ascending to ascending, usually reddish; herbage glabrous or sparsely to densely pubescent with soft, branched hairs; leaves alternate, sessile, semicylindric and more or less involute or subulate, mostly 0.8-6 cm long, 0.5-3 mm wide, apiculate; inflorescence slender and elongate or compact, the bracts broadly scarious-margined, with the lower ones narrower or broader than the fruit, the upper ones usually broader than the fruit; perianth mostly consisting of a single posterior erose segment (rarely with 2 additional small anterior-lateral segments); stamens 3-5; fruit 2.2-4.1 mm long, 1.6-2.6 mm wide, oval to suborbicular, smooth, glabrous, brownish; wings opaque, stramineous, one-eighth to one-fifth as wide as the body. Usually in sand, in ephedra, four-wing saltbush, rabbitbrush, scurfpea, and pinyon-juniper communities, at 1065 to 1955 m in Duchesne, Garfield, Grand, Juab, Kane, Millard, San Juan, Uintah, and Wayne counties; Montana and North Dakota, south to Arizona, New Mexico, and Texas; 20 (iv). Our specimens have long been presumed to be introduced and conspecific with either *C. hyssopifolium* L. and/or *C. nitidum* Kit. in Schult. While the details of those taxa are reported in contradictory fashion in Flora SSSR (6:146-149. 1936) versus the Flora Europaea (1:99-100. 1964), it seems clear that our plants cannot be *C. hyssopifolium*, which is reported to have flat leaves. The description of our specimens more nearly fits that of *C. nitidum*, but that plant has filiform leaves, not semicylindric ones as in ours. Further, our plants grow in native plant communities and are not weedy; their distribution pattern

is that of numerous other indigenous taxa. Plants of this genus were described historically from the edge of civilization and beyond in North America (Nuttall, Genera of North American Plants 1:4. 1818; Hooker, Flora Boreale Americana 2:126. 1838; Watson, Proc. Amer. Acad. 9:123. 1874). Although not definitive evidence of nativity, these historical data add to the weight of evidence for the indigenous nature of the genus in North America. Because of these considerations I have, arbitrarily, chosen the earliest name available at specific level for our plants. Both elongate slender and short broad inflorescences are represented within our specimens, along with occasional intermediates. There is little correlation of inflorescence type with other morphological features or geography.

CYCLOLOMA Moq.

Annual herbs; stems commonly branched and forming rounded clumps; leaves alternate, sinuate-dentate; herbage more or less pubescent, eglandular; inflorescence a panicle of interrupted spikes; flowers sessile; perianth 5-lobed, the segments in fruit with a transverse wing on the back, the wings connate and completely encircling the fruit; stamens 5; achenes depressed; seeds horizontal.

Cycloloma atriplicifolia (Spreng.) Coult. Winged-pigweed. [*Salsola atriplicifolia* Spreng.]. Plants mainly 0.8-5 dm tall (rarely more), divaricately branched, the stems striate, loosely and sparingly tomentulous, becoming glabrate; leaves short petioled to sessile, the blades 1-8 cm long, 2-15 mm wide, coarsely serrate-dentate, acute apically, cuneate basally; flowers perfect and pistillate; sepals 5, keeled, the perianth developing into a horizontal wing; wings white-hyaline, lobed or toothed, 4-5 mm in diameter, often red or purple at maturity; ovary tomentulose; styles 2 or 3; fruit enclosed in calyx; seed ca 1.5 mm wide, black, smooth; pericarp not adherent. Sandy habitats in blackbrush, mixed desert shrub, and juniper communities at ca 1125 to 1465 m in Garfield, Grand, Kane, San Juan, and Wayne counties; Manitoba and Indiana, south to Arizona and Texas; adventive in Europe; 10 (iii).

GRAYIA H. & A.

Dioecious or less commonly monoecious shrubs or subshrubs; branches more or less thorny; axillary buds subglobose, prominent; leaves alternate, entire; herbage or pubescent with simple or stellate hairs; flowers in terminal and axillary spicate panicles, imperfect; staminate flowers 2–5 in clusters in bract axils, not separately bracteolate, the perianth 4- or 5-lobed, subequal to the 4 or 5 stamens; pistillate flowers 1-several per bract, often some vestigial, each enclosed by 2 connate bracteoles, the more or less accrescent bracteoles obcompressed, the margins thickened and spongy within; fruits vertical; stigmas 2.

Grayia spinosa (Hook.) Moq. Hopsage. [*Chenopodium* (?) *spinosum* Hook.; *G. polygaloides* H. & A.]. Shrubs, mainly 5–12 (15) dm tall; branches gray brown; branchlets with bark exfoliating in long strips; pubescent with scurfy and stellate hairs when young, often spinose-persistent; leaves 5–30 mm long (or more), mainly 2–12 mm wide, spatulate to oblanceolate, entire, tapering to a short petiole; staminate flowers with usually 4-lobed perianth, enclosing the 4 stamens, 1.5–2 mm long; pistillate flowers in short spicate inflorescences, the subtending bracts reduced, enclosed by paired, accrescent, obcompressed bracts, orbicular or cordate, the wings thickened and spongy within, 6–15 mm wide, greenish, straw colored, or suffused with red. Blackbrush, other warm desert shrub, shadscale, horsebrush, rabbitbrush, sagebrush, and pinyon-juniper communities at 760 to 2900 m in Beaver, Box Elder, Daggett, Davis, Duchesne, Garfield, Grand, Juab, Kane, Millard, Piute, San Juan, Sevier, Uintah, Utah, and Washington counties; Washington to Montana, south to California, Arizona, and New Mexico; 91 (xvii). This is a valuable browse plant for livestock, especially for sheep. Locally it is called "applebush" because of its palatability. For consideration of relationship to *G. brandegei* see discussion under *Zuckia*.

HALOGETON C. A. Mey.

Annual herbs; leaves alternate, fleshy and sausagelike, bearing an apical slender spine;

flowers perfect or partially pistillate, usually bracteolate; perianth of 5 segments, free nearly to the base, embedded in white hair, the segments gibbous, winged in fruit; stamens 2–5, connate basally into a glandular, hypogynous disk; stigmas 2; seeds vertical, laterally flattened, adherent to the pericarp.

Halogeton glomeratus (Bieb.) C. A. Mey. Halogeton. [*Anabasis glomerata* Bieb.]. Plants mainly 3–45 cm tall and as broad, glaucous, usually branched from the base, with curved-ascending branches; leaves mainly 3–15 mm long and 1–2 mm thick, terete, dilated and semiamplexicaul basally, obtuse and terminating in a deciduous slender spine ca 1–1.5 mm long, bearing a tuft of hairs and fascicled leaves in the axils; bracteoles ovate; perianth segments membranous, ovate to oblong, 1-veined, with lustrous, membranous, fanlike, veiny wings 2–3 mm long and 3–4 mm wide; stamens united into 2 clusters of 2 or 3, with 1 anther per cluster; fruit oval to obovate, 1.2–1.8 mm long, with an erect cusp on one or both sides. Mainly in disturbed sites in cheatgrass, Russian thistle, salt grass, mixed desert shrub, salt desert shrub, and pinyon-juniper communities at 1220 to 1985 m in most, if not all, Utah counties; widely distributed in western U.S.; adventive from Eurasia; 47 (x). This plant was introduced into northern Nevada in the early 1930s (first collected in 1934), possibly for use in grazing experiments. It spread quickly into the desert lands of Nevada and western Utah, and subsequently into eastern Utah and other states. The plant is rich in oxalates and poses a serious threat to grazing animals, especially to sheep, which have suffered heavy death losses for several decades.

KOCHIA Roth

Annual herbs or subshrubs; leaves alternate (or some opposite), linear to narrowly lanceolate, in some fleshy and terete; flowers 1 to several, sessile in axils of foliose bracts, mostly perfect, 5-merous, the perianth lobes enclosing the fruit, keeled and horizontally winged; stamens mostly 5; stigmas 2 or 3; pericarp thin, free from the horizontal, smooth seed.

- 1. Plants subshrubs, introduced for reclamation *K. prostrata*
- Plants annual or perennial herbs, woody, if at all, only at the base 2
- 2(1). Plants annual, introduced weeds of disturbed habitats *K. scoparia*
- Plants perennial, woody at the base, indigenous in saline habitats *K. americana*

Kochia americana Wats. Gray Molly. [*K. americana* var. *vestita* Wats., type from shores of the Great Salt Lake; *K. vestita* (Wats.) Rydb.]. Plants mainly 5–30 cm tall, with erect branches from a woody base; herbage villous-pilose to glabrous; leaves 5–25 mm long, 1–2 mm wide, linear, semiterete and fleshy; flowers solitary or 2–5, sessile in axils of scarcely reduced leaves; inflorescence often more than half the branch length; perianth segments pubescent, at least apically, 1–1.5 mm long, hooded above, somewhat enlarged in fruit, ultimately keeled and with a membranous, striate wing to 2 mm long and 3 mm wide. Greasewood, seepweed, saltbush, saltgrass, matchweed, horsebrush, and pinyon-juniper communities at 1125 to 1985 m in Beaver, Cache, Emery, Garfield, Grand, Iron, Juab, Millard, Salt Lake, San Juan, Sevier, Tooele, Uintah, Utah, and Wayne counties; Oregon to Montana, south to California, Arizona, and New Mexico; 65 (v).

Kochia prostrata (L.) Schrad. [*Salsola prostrata* L.]. Subshrubs, mainly 10–75 cm tall; stems erect or steeply ascending, more or less pubescent with short crinkly hairs often intermixed with longer villous ones; leaves 3–12 mm long, 0.3–0.7 mm wide, linear to filiform, flat; inflorescence spiciform to paniculate; flower clusters interrupted; perianth hairy dorsally, the appendages round, flat, and tuberculate or oblong and winglike (ca 1 mm long and 1.5 mm wide), often suffused with red; seeds oval or orbicular in outline, ca 2 mm wide, brown, smooth. This plant is being tried in reclamation plantings and is to be expected throughout Utah; introduced from Eurasia; 1 (0).

Kochia scoparia (L.) Schrad. Summer-cypress. [*Chenopodium scoparium* L.]. Annual herbs, mainly 3–12 (15) dm tall, green, or suffused with red in autumn, simple or branching from the base, villous and often finely lanate to glabrous; leaves 0.8–4.5 (6) cm long, 1–4 mm wide, lanceolate to oblanceolate, elliptic or linear, usually 3- to 5-veined, glabrous or softly pilose below (and above) or glabrous above, generally ciliate, acute; inflorescence spicate, interrupted; fruiting perianth of perfect flowers glabrous dorsally, ciliate, mostly transversely keeled, tubercled or sometimes horizontally winged from middle of the keel; pistillate flowers often lacking a keel; seeds ovate in outline, 1.5–2 mm long. Disturbed roadsides, canal banks, field margins, and other waste places in salt marsh, sedge-rush, sagebrush, mountain brush, and pinyon-juniper communities at 850 to 1985 m in probably all Utah counties; widespread in North America; adventive from Eurasia; 38 (ii). The cultivated ornamental phase, with bright red or red-orange foliage is forma *trichophylla* (Hort.) Staph ex Schinz & Thell. [*K. trichophylla* Hort. ex Voss]. Some workers have suggested that our material belongs to the Russian species *K. iranica* (Hauskn. & Bornm.) Litv. [*Salsola iranica* Hauskn. & Bornm.], but materials examined fit neither key diagnostic nor other descriptive features of that taxon (see Flora SSSR 6:128–134. 1936).

Annual, polygamo-monoecious herbs; leaves simple, hastately lobed or entire, alternate, mealy to subglabrous, fleshy; flowers unisexual, inconspicuous, borne in axillary clusters; perianth consisting of 1 bractlike scale (rarely 2 or 3, or lacking), not enclosing the fruit; stigmas 2; pericarp reticulately patterned or warty, adherent to the erect seed.

MONOLEPIS Schrad

- 1. Plants dichotomously branched, the ultimate branches filiform; leaves small and inconspicuous, entire; flowers 5 or fewer per axillary cluster; perianth segments 1–3, linear; plants rare *M. pusilla*
- Plants not dichotomously branched, the ultimate branches not filiform; leaves conspicuous, commonly at least some hastately lobed; plants common *M. nuttalliana*

***Monolepis nuttalliana* (Schultes) Greene**
 Poverty-weed. [*Blitum nuttallianum* Schultes in R. & S., based on *B. chenopodioides* Nutt.; *M. chenopodioides* (Nutt.) Moq. in DC.]. Plants mainly 4–30 cm tall, the stems prostrate or ascending to erect, simple or much branched from the base, mealy to subglabrous; leaves 5–50 mm long, the blades 1–15 mm wide, lanceolate to elliptic or oblong, with one pair of lateral lobes near the middle, reduced upward and sometimes entire, the petiole 1–20 mm long; flowers borne in dense, sessile, axillary clusters; perianth segments 1–2 mm long, more or less acute apically; pericarp pitted, usually pale; fruit 0.9–1.5 mm broad. Pioneer plant of open sites in blackbrush, shadscale, mat saltbush, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, Douglas fir-limber pine, aspen, and lodgepole pine communities at 350 to 3355 m in probably all Utah counties; Alaska and Yukon to California and New Mexico, east to Manitoba and Missouri; 70 (xiv). The correct name for this plant seems to be *M. chenopodioides*, there being no apparent obstacle to the transfer of *Blitum chenopodioides* to *Monolepis*. However, I hesitate to suggest the change until further research corroborates such a necessity.

***Monolepis pusilla* Torr. ex Wats.** Plants clump-forming, 3–20 cm tall and as broad or wider; leaves 4–12 mm long, oblong, entire, short-petioled; flowers 1–5, in sessile clusters; sepals spatulate, obtuse, 1–3; pericarp tuberculate; seeds dull, ca 0.5 mm wide. Salt desert shrub at ca 1500 m in Uintah County (Holmgren et al. 1934 BRY); Oregon to Wyoming, south to California and Nevada; 1 (0)

- 1. Plants annual, from slender taproots, the main stems mostly less than 3 mm thick; central flower much above the lateral ones *S. europaea*
- Plants perennial from thick rhizomes and fibrous roots, the main stem mostly more than 3 mm thick; central flower not much above the lateral ones
 *S. utahensis*

***Salicornia europaea* L.** Annual Samphire. [*S. rubra* A. Nels.; *S. europaea* ssp. *rubra* (A. Nels.) Breitung; *S. trona* Lunnell; *S. europaea* var. *trona* (Lunnell) B. Boi.]. Annual Samphire. Plants annual, mainly 9–30 cm tall, from slender taproots; stems fleshy, erect or

NITROPHILA Wats.

Perennial rhizomatous herbs from a definite caudex; leaves opposite, linear to oblong, fleshy, clasping, entire; flowers perfect, axillary, 2-bracteolate, solitary or in 3s; calyx chartaceous, with 5 sepals, these keeled, 1-veined; stamens 5, united basally into a perigynous disk; style filiform, with paired stigmas; fruit ovoid, beaked, included in connivent sepals; seeds vertical, lenticular.

***Nitrophila occidentalis* (Moq.) Wats.** Niterwort. [*Banalia occidentalis* Moq. in DC.]. Plants glabrous, mainly 10–30 cm tall; stems with opposite branches, erect or ascending; leaves 0.7–2 cm long, linear, semi cylindrical, sessile, mucronate; flowers sessile; sepals 2–3 mm long, oblong, stramineous (pinkish when fresh); fruit brown; seed shining, black, ca 1 mm wide. Saline clay substrate in saltbush, pickleweed, alkali saccaton community in Snake Valley, Millard County (Welsh, Taylor, and Thorne 14516 BRY); Oregon to California, Nevada, and Mexico; 1 (i).

SALICORNIA L.

Annual or perennial herbs from taproots or rhizomes; leaves simple, scalelike, opposite, connate, glabrous; flowers perfect, borne sessile in opposite groups of 3, sunken in depressions of thickened, terminal spikes, subtended by scalelike bracts; perianth consisting of 4 connate segments free at the tip around a slitlike opening, enclosing the fruit; stigmas commonly 2; pericarp thin, free from the erect, retrorsely pubescent seed.

ascending, commonly branched, often reddish at maturity; leaves scalelike, often with a scarious margin; spikes 0.5–5 cm long, 2–3 mm thick, the joints 2–4 mm long; central flower much above the lateral ones; fruit dehiscent, the seeds falling separately. Saline

substrates in salt marsh, seepweed, poverty weed, alkali saccaton, and saltgrass communities at 1280 to 1465 m in Box Elder, Cache (?), Juab, Millard, Salt Lake, Tooele, Uintah, and Utah counties; widespread in North America; Eurasia; 19 (ii). Our specimens are supposed to differ from the more coastal ones in having slender spikes with joints about as thick as long, but no such correlation is apparent. Recognition of our material at infraspecific level seems moot.

Salicornia utahensis Tidestr. Utah Sampire. [*S. pacifica* Standl. var. *utahensis* (Tidestr.) Munz]. Plants perennial, mainly 9–30 cm tall, from coarse rhizomes and thick fibrous roots; stems fleshy, erect or ascending, not creeping and rooting at the nodes, turning gray or brown at maturity; leaves scalelike, with scarious margins; spikes 0.6–5 cm long, 3–4 mm thick the joints 3–5 mm long, breaking at the joints when mature, the central flower not especially above the others; fruit dehiscent, the seeds falling separately, sometimes adherent to the calyx. Sa-

- 1. Leaves mainly 0.3–1.8 mm wide and 1.5–4 (6) cm long, slender; wings of fruiting calyx usually 1–2 mm long *S. iberica*
- Leaves mainly 1–1.5 mm thick and 0.5–2 cm long, thick and rigid; wings of fruiting calyx mainly 3–4 mm long *S. paulsenii*

Salsola iberica Sennen & Pau Russian-thistle; tumbleweed. [*S. pestifer* A. Nels.; *S. kali* authors, not L.?]. Plants with simple stems or freely branched, clump-forming, appearing taller than wide, 1–10 dm tall; stems with red-purple, longitudinal striations, glabrous or pubescent; leaves mainly 1.5–4 (6) cm long, 0.3–0.8 mm wide, narrowly linear or filiform, spinulose apically, modified upward as spinescent bracts with expanded bases and scarious margins; perianth segments distinct, membranous in anthesis, in fruit becoming transversely winged, the wings mainly 1–2 mm long; seeds horizontal. Weedy species of disturbed habitats at 760 to 2440 m in probably all Utah counties; widespread in North America; adventive from Asia; 62 (vi). This species forms intermediates with the next. It is unfortunate that so many specific epithets have been applied to this weedy introduction, and possibly even the above name is not unequivocally correct.

line substrates in salt marsh, pickleweed, and saltgrass communities at 1280 to 1405 m in Box Elder, Millard, Salt Lake, Tooele (type from shore of Great Salt Lake), and Utah counties; endemic ? (reported from California?); 11 (ii). Our material differs markedly from the similar coastal species assigned to either *S. pacifica* Standl. or *S. virginica* L.

SALSOLA L.

Annual herbs; leaves alternate, entire, commonly spinulose; flowers perfect, 5-merous, solitary or clustered in axils of spiny bracts, each with 2 smaller bracteoles, borne in spicate inflorescences; fruiting perianth with winglike, mostly horizontally spreading ridges; stamens 5, usually inserted at the margin of a lobed disk; styles 2 or 3; fruit closely enveloped in the persistent calyx; seeds horizontal to oblique.

BEATLEY, J. C., 1973. Russian thistle (*Salsola*) species in western United States. *J. Range Management* 26:225–226.

Salsola paulsenii Litv. Barbwire Russian-thistle. Plants commonly freely branched, clump forming, appearing wider than tall, mainly 10–40 cm tall and usually broader; stems yellowish green, seldom purplish striate, pubescent or glabrous; leaves mainly 0.5–2 cm long, 1–2 mm thick, linear, rigid, spinose apically, modified upward as spinose bracts with wide bases and scarious margins; perianth segments yellowish, membranous in anthesis, becoming transversely winged, the wings 2–4 mm long in fruit; seeds horizontal. Weedy species of disturbed habitats at 915 to 1830 m in Carbon, Garfield, Juab, Kane, Millard, Tooele, Washington, and Wayne counties; Arizona, Nevada, and California; 12 (iii). A third species, *S. collina* Pallas, might be present in Utah. It has long slender spicate inflorescences with appressed bracts and bracteoles, and in the lower portions the flowers are usually gall-like.

SARCOBATUS Nees

Thorny shrubs; leaves mostly alternate, linear, fleshy, sessile; flowers imperfect, borne in axillary spikes, the staminate ones spirally arranged, ebracteate, and lacking a perianth; stamens 2 or 3, borne beneath stalked peltate scales; pistillate flowers sessile, 1 or 2, in the axils of scarcely reduced leaflike bracts, the pistil surrounded by a cuplike, shallowly lobed to subentire perianth, this accrescent and adherent to the fruit base, its upper portion flaring to form a broad, winglike border; seeds erect, flattened, orbicular.

Sarcobatus vermiculatus (Hook.) Torr. in Emory. Greasewood. [*Batis* (?) *vermiculata* Hook.; *Fremontia vermicularis* (Hook.) Torr. & Frem.]. Shrubs, mainly 10–20 dm tall or more; branches rigid, spreading, often modified as thorns; leaves 0.3–4.5 cm long, 1–3 mm wide, semicylindric, linear; staminate spikes catkinlike, 1–4 cm long; pistillate flowers fewer than the staminate ones, the perianth ca 1 mm long; calyx wing 2–6 mm long; fruit 4–5 mm long, cup shaped below the wing; seeds brown, ca 2 mm long. Greasewood, seepweed, saltbush, and other plant communities of saline substrates, at 1220 to 2170 m in most if not all Utah counties; Washington and Alberta to North Dakota, south to California, Arizona, New Mexico, and Texas; 72 (x). This is an important

browse species for cattle and sheep, even though potentially poisonous.

SPINACIA L.

Annual or biennial glabrous herbs; flowers borne in dense spicate inflorescences; pistillate flowers lacking a perianth, but with 2 (rarely 3 or 4) persistent bracteoles that enlarge, become connate, and harden in fruit; stigmas 4 or 5; seeds vertical.

Spinacia oleracea L. Spinach. Plants mainly 2–6 dm tall or more, erect; leaves mainly 3–15 cm long and 2–10 cm wide, ovate to triangular, often hastately lobed; bracteoles in fruit orbicular to obovate, often with a spreading spine at the apex. Cultivated potherb throughout Utah, mainly below 2135 m; introduced from Eurasia; 1 (0). This plant escapes occasionally, but does not persist.

SUAEDA Forsk. ex Scop. Nom. Cons.

Annual or perennial herbs or shrubs; leaves alternate, entire, terete or flattened, often succulent; flowers inconspicuous, mostly perfect, solitary or clustered in leaf axils, bracteate; calyx 5-lobed, fleshy, the lobes equal and unappendaged or unequal and some more or less corniculately appendaged; stamens 5, the filaments short; ovary subglobose or depressed; seeds horizontal or vertical.

- 1. Plants suffrutescent or definitely shrubby; leaves abruptly short-petiolate; calyx lobes equal, not appendaged, smooth dorsally; herbage glabrous or puberulent; seeds vertical or horizontal *S. torreyana*
- Plants annual; leaves sessile; calyx lobes unequal in fruit, horned; herbage glabrous; seeds horizontal 2
- 2(1). Plants often over 3 dm tall, erect, not clump-forming, the branches stiffly erect-ascending; flowers mostly 3–7 per axil *S. calceoliformis*
- Plants mainly 0.5–3 dm tall, forming depressed rounded clumps, the branches spreading, more or less flexuous; flowers 1–3 per axil *S. occidentalis*

Suaeda calceoliformis (Hook.) Moq. Broom Seepweed. [*Chenopodium calceoliforme* Hook.; *S. depressa* authors, not (Pursh) Wats.; *S. depressa* var. *erecta* Wats.]. Plants glabrous, often glaucous, erect, simple or with erect-ascending branches and broomlike, 1–5 (8) dm tall; leaves mainly 1–4 cm long, 1–2 mm wide, linear or tapering from base to apex, semiterete, intergrading with

floral bracts upward; spikes slender; flowers sessile, mostly in clusters of 3–7; calyx lobes unequal, ca 1.5 mm long, at least some conspicuously horned; fruit horizontal; seeds smooth, 1–1.5 mm wide, dark brown. Saline palustrine or riparian sites in saltgrass, greasewood, seepweed, alkali saccaton, and cat-tail-sedge communities at 850 to 2440 m in Box Elder, Cache, Davis, Duchesne, Emery,

Grand, Millard, Salt Lake, Sanpete, Sevier, Uintah, Utah, Washington, and Weber counties; British Columbia to Saskatchewan, south to California, Arizona, New Mexico, and Texas; 35 (vi).

Suaeda occidentalis (Wats.) Wats. Western Seepweed. [*Schoberia occidentalis* Wats.]. Plants glabrous, often glaucous, forming depressed rounded clumps, not broomlike, mainly 0.5–3 dm tall, seldom simple; leaves mostly 0.5–2 (3) cm long, linear-oblong, semi-cylindric, intergrading with floral bracts upward; spikes slender; flowers sessile, mostly 1–3 per cluster; calyx lobes unequal, ca 1.5 mm long, at least some conspicuously horned; fruit horizontal; seeds smooth 1–1.5 mm wide, dark brown. Saline palustrine or riparian habitats in greasewood, saltgrass, seepweed, and other such communities at 1280 to 2135 m in Beaver, Box Elder, Cache, Duchesne, Salt Lake, Sevier, and Utah counties; Washington to Wyoming, south to Nevada and Colorado; 12 (i).

Suaeda torreyana Wats. Torrey Seepweed. Plants glabrous or pubescent, sometimes glaucous, suffrutescent or definitely shrubby, 1–12 (15) dm tall or more, with slender ascending to spreading branches; leaves 0.5–3.5 cm long, 1–3 mm thick, subterete to flattened, abruptly short petiolate, intergrading with floral bracts upward; flowers 1–8 or more per axil; calyx lobes equal, ca 1.5–2 mm long, the lobes merely rounded dorsally, not horned or tuberculate; fruit horizontal or vertical; seeds 0.8–1.2 mm wide, black, shiny. Greasewood, seepweed, saltgrass, and other salt desert shrub communities, often in riparian or palustrine habitats at 1125 to 1955 m in Box Elder, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Salt Lake, San Juan, Sevier, Tooele, Uintah, Utah, and Wayne counties; California, Nevada, Wyoming, Arizona, and Mexico; 79 (xiv). Materials cited with the above description belong to *var. torreyana* [*Chenopodina linearis* Torr., type from Great Salt Lake; *C. nigra* authors, not (Raf.) Macbr.] A second variety, sometimes treated at specific rank, is based on densely puberulent plants. It is *var. ramosissima* (Standl.) Munz [*Dondia ramosissima* Standl.; *S. intermedia* Wats., type from Sevier or Washington counties]. Saltgrass, shadscale, greasewood and other salt desert

shrub communities at 850 to 1400 m in Juab, Millard, Salt Lake, Sevier, and Washington counties; Arizona and California; 11 (0). Phases of this variety from Washington County seem to have more steeply ascending and more elongate branches than those from elsewhere in Utah. Possibly all of the variants are taxonomically negligible.

ZUCKIA Standl.

Dioecious or less commonly monoecious shrubs or subshrubs; branches not thorny; axillary buds subglobose, prominent; leaves alternate, entire or more or less lobed; herbage more or less scurfy; staminate flowers 2–5 in clusters in bract axils, not separately bracteolate, the perianth 4- or 5-lobed, subequal to the 4 or 5 stamens; pistillate flowers 1 to several per bract, often some vestigial, each enclosed by 2 bracteoles, these dorsiventrally flattened and unequally 6-keeled or obcompressed and thin-margined, often subtended by a single filiform bractlet; fruits vertical or horizontal; stigmas 2.

Zuckia brandegei (Gray) Welsh & Stutz comb. nov. Siltbush. [based on: *Grayia brandegei* Gray Proc. Amer. Acad. 11:101. 1976]. Plants mainly 1–5 dm tall; branching from a persistent woody base ca 0.5–2 dm tall, the annual stems erect or ascending; herbage more or less scurfy and less commonly with some moniliform hairs in inflorescence; leaves subsessile or tapering to a short petiole, 13–80 mm long, 15–42 mm wide, linear or narrowly oblanceolate-spatulate to elliptic, ovate, obovate, or orbicular, entire or rarely hastately lobed; staminate flowers with a 4- or 5-lobed stramineous perianth, cleft to the middle or below, ca 1.5–1.8 mm long; pistillate bracts obcompressed or dorsiventrally compressed, with vertical or horizontal fruits, respectively, but not exclusively, when mature either flattened and 4–8 mm wide or 6-keeled (with 4 small and 2 large keels) and 2–4 (5) mm wide; fruits included within the bracts. It has long been recognized that *Grayia brandegei* was not a close congener of *G. spinosa*, type species of the genus *Grayia*, even though they shared features of bract compression and rounded axillary buds. They differ markedly in gross morphology, in vestiture, and in nature of the bracts. The bracts

of *G. spinosa* are thickened marginally, and filled internally with a spongy cellular matrix. Those of *brandegei* are thin margined, and do not possess a spongy cellular matrix. Some workers have suggested that *G. brandegei* should be removed from its long association with *G. spinosa* and placed within the *gardneri* phase of *Atriplex*. The differences between *Z. brandegei* and any of the *Atriplex*

species are striking even though the plants in vegetative condition might be confused. Bract and bud differences in *Zuckia* are correlated, apparently, with C-3 type of photosynthesis and its attendant foliar morphology, and the shrubby atriplexes have the C-4 type of photosynthesis with its foliar morphology. Two more or less distinctive but intergrading phases are present.

- 1. Fruit dorsiventrally compressed; bracts 6-keeled; fruit mostly horizontal
 *Z. brandegei* var. *arizonica*
- Fruit obcompressed; bracts 2-winged, samaralike; fruit mostly vertical
 *Z. brandegei* var. *brandegei*

Var. *arizonica* (Standl.) Welsh comb. nov. [based on: *Zuckia arizonica* Standl. J. Washington Acad. Sci. 5:58. 1915]. Fine-textured or sandy, often saline and seliniferous substrates on Entrada, Morrison, and Duchesne river formations in Emery, Uintah, and Wayne counties; Arizona; 10 (i). Despite the distinctive bracts and horizontal fruits, the plants are well within the range of vegetative variation existing in plants of *Z. brandegei* in a strict sense. Staminate plants of this variety have not previously been discerned from among the general collections of *Z. brandegei*. Previous descriptions of *Zuckia* and its only species (*arizonica*) are conspicuous in lacking discussion of staminate features. Supposed differences in vesture between the taxa apparently do not exist, and other diagnostic morphology is unknown.

Var. *brandegei* Fine-textured, often saline and seleniferous substrates on the Duchesne R., Uinta, Kaiparowits, Summerville, Morrison, Chinle, and Moenkopi formations (and probably others) at 1280 to 2440 m in Daggett, Emery, Garfield, Grand, Kane, San Juan, Sevier, Uintah, and Wayne counties; Colorado and Arizona; 66 (xii). Both broad and narrow-leaved phases of both varieties are known, and there is a tendency for the wideness of leaves to be geographically correlated (i.e., the broad-leaved populations from the Uinta Basin and those on "The Blues" of the Kaiparowits Formation northeast of Henrieville and north of Four-Mile Bench), but the plants differ in no other discernible way. Probably these variants do not warrant taxonomic recognition.